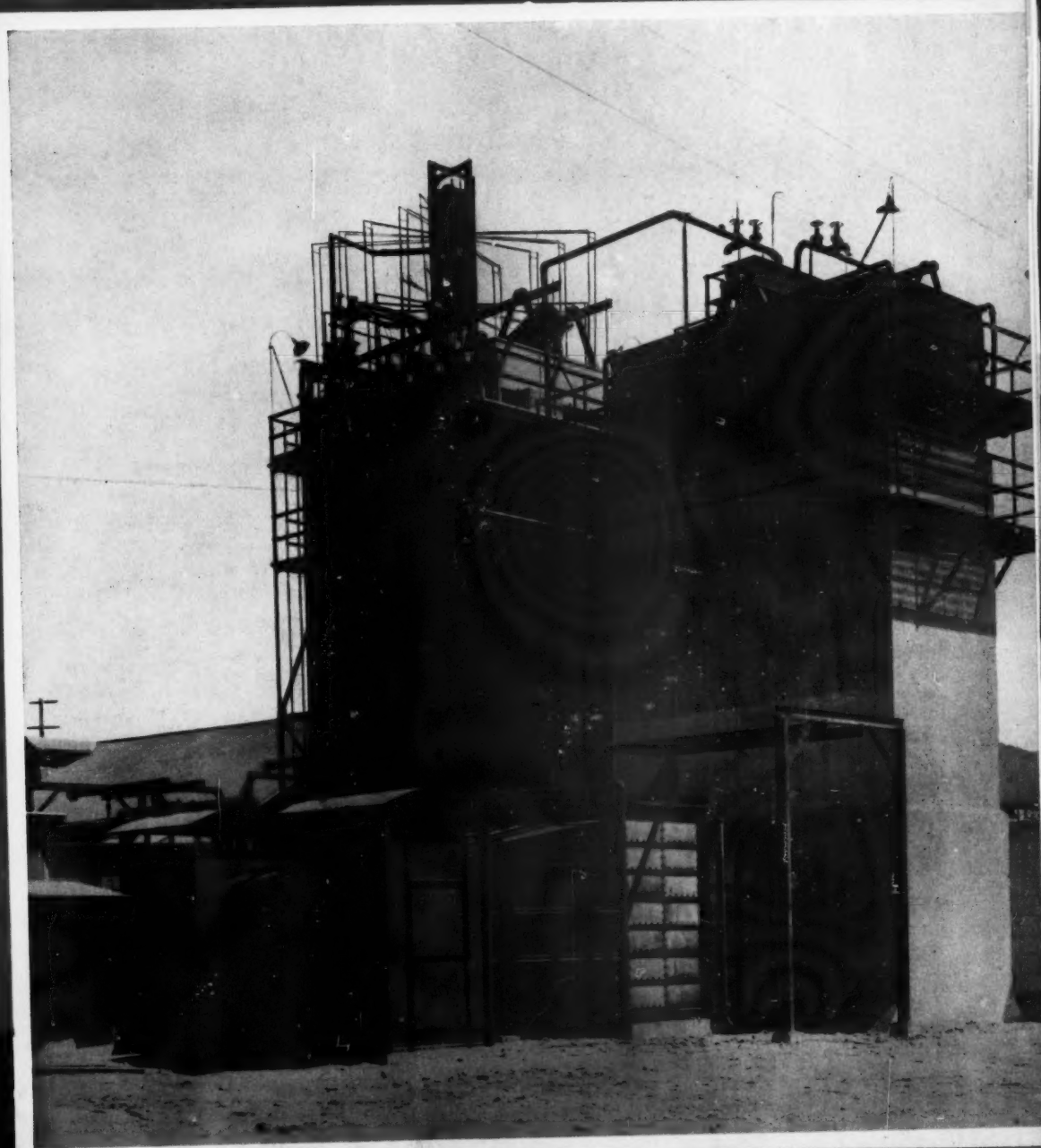


# MINING CONGRESS JOURNAL

JANUARY, 1940



OFFICIAL





*at the*  
**COAL SHOW**

THE ANNUAL COAL CONVENTION AND EXPOSITION of the American Mining Congress is the greatest cooperative event in the coal mining world. Through the past 16 years, coal mining men and manufacturers have made the Coal Show the focal point of their combined activities for the advancement of the industry.

GREAT ADVANCES have been scored in the adoption of new equipment and improved mining methods during the past few years—but the tempo of progress in the immediate future promises to outstrip anything yet. It's going to be a real job to "keep up."

YOU'LL LEARN of the present and get a glimpse into the future—at the Coal Show! You'll come away chock-full of ideas gained from discussion of common problems with your fellow operating men and manufacturers. You'll know just what is available to you in every imaginable kind of mining equipment and supplies.

*Boost Your Industry — Attend The Coal Show*

—●—  
*American Mining Congress*

**17<sup>TH</sup> Annual Coal Convention & Exposition**

MUSIC HALL

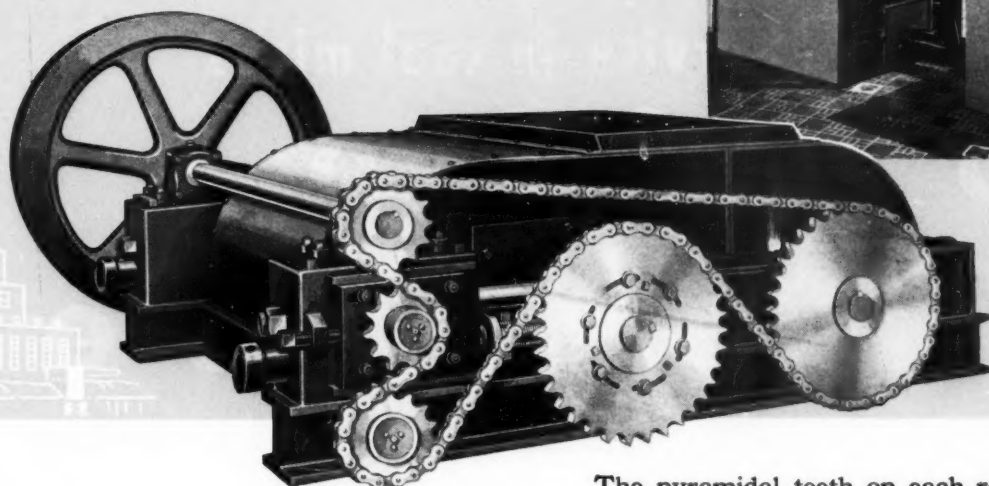
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Greater realization of stoker and all other premium sizes, and increased profits can be yours with this Link-Belt 2-roll adjustable sizer.

It is a tried and proved unit that can be easily and quickly adjusted by means of a simple mechanism to economically produce a variety of sizes.

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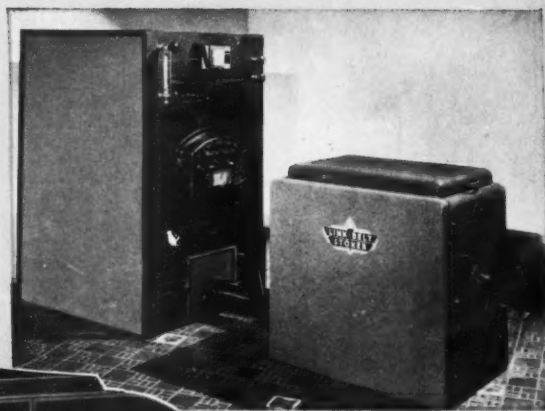
**... MINIMUM OF FINES and OVERSIZE**

Scientifically-spaced, accurately meshed pyramidal teeth, combined with a low roll speed, cause a piercing action which reduces the coal without shattering or crushing.

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The pyramidal teeth on each roll of the Link-Belt chain-driven sizer are accurately meshed centrally with respect to each other, as illustrated below. This is not possible with gear-driven machines.

**OLD STYLE  
GEAR-DRIVEN CRUSHER**



Note unequal spacing between roll-teeth as they mesh. This promotes degradation and oversize in the product.

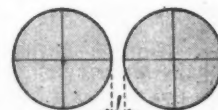
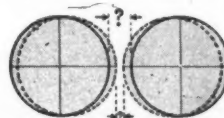
**LINK-BELT  
CHAIN-DRIVEN SIZER**



Note equal spacing between roll-teeth as they mesh. This results in closer size-uniformity of the product.



The design of the Link-Belt chain-driven sizer permits placing the flywheel on the countershaft, with its consequent obvious advantages, instead of on one roll shaft as with gear driven crushers.



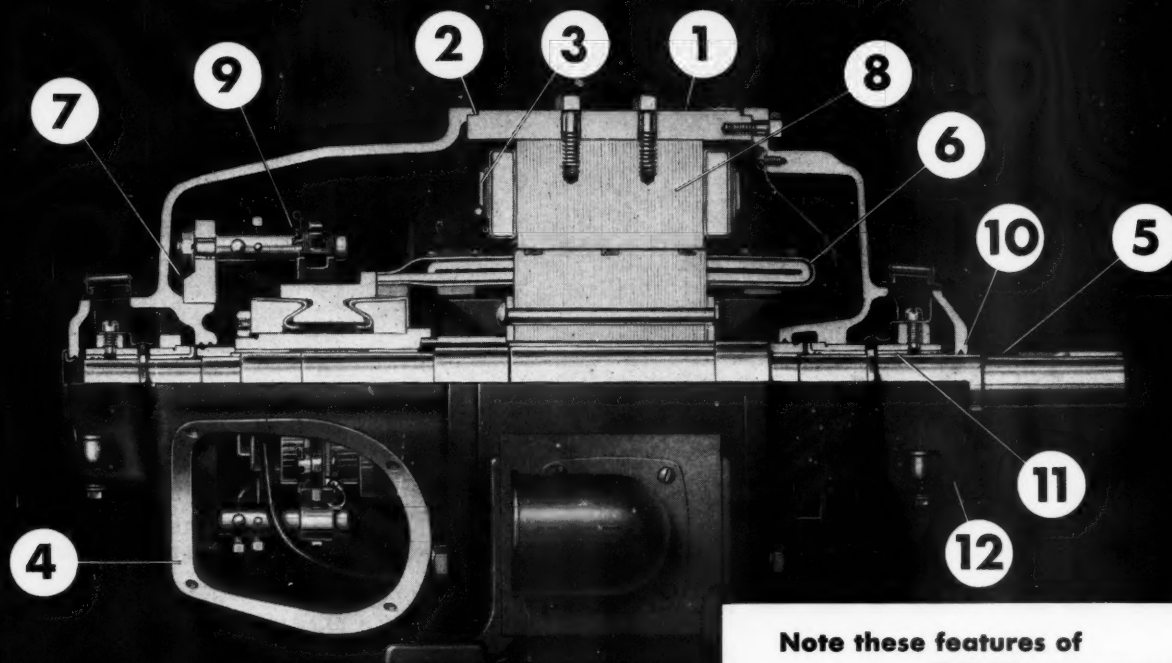
Link-Belt roll segments are ground to accurate fit and when assembled form a concentric roll. Visualize the effect of these rolls on the uniformity of the sized product as compared with inaccurately made segments, as illustrated above.

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Why G-E direct-current motors give long,  
low-cost service in coal mines



Cutaway view of a G-E  
direct-current motor

SEE for yourself that there's no mystery about the ability of G-E direct-current motors to give excellent performance in coal mines.

No mystery—just facts; facts about their design and construction that show why they can be relied upon to give years of dependable, low-cost service wherever they're installed. Take a minute to check these facts for yourself, remembering that because of space limitations they form only a partial list.

Long bearing life, excellent commutation, a highly protective insulation with remarkable bonding qualities, easily accessible brush rigging, convenient lubrication system—you find all these advantages in G-E d-c motors.

Remember this, particularly—these motors can be furnished with steel plates over the end shields to protect against dripping water or falling particles of solid matter. Perforation of the bottom plates assures effective ventilation. Thus, you get a real mining motor available in a wide variety of standard ratings, speeds, and enclosures. Our nearest representative will be glad to give you complete details. General Electric, Schenectady, N. Y.

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11. Steel-shell, babbitted bearing linings.
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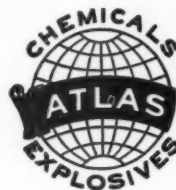
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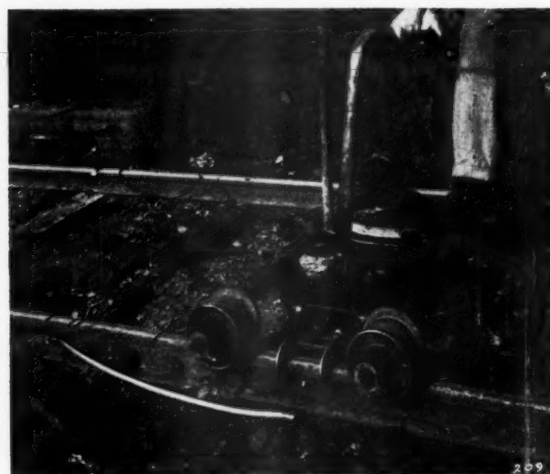
**SPEEDS UP BONDING TIME.** A recent trial installation of the Wedge Bond resulted in an average installation time of 56 seconds per bond. This included drilling or reaming the rail, placing the terminals in the holes and hammering the wedge pins into permanent engagement.



**EASY TO RECLAIM OR INSPECT.** A simple blow with the hammer from the other side of the rail will release the wedge and the bond terminal. Bonds so removed can be re-installed time and again. This feature permits easy removal and easy replacement of the terminal for inspection.



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**PROVIDES LOW RESISTANCE.** The all-copper, cold-forged Wedge Bond provides a dependable return circuit with minimum resistance. Power losses, which can run into thousands of dollars of waste per year, are, themselves, "thrown for a loss."

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia  
*The World's Largest Manufacturers of Storage Batteries for Every Purpose*  
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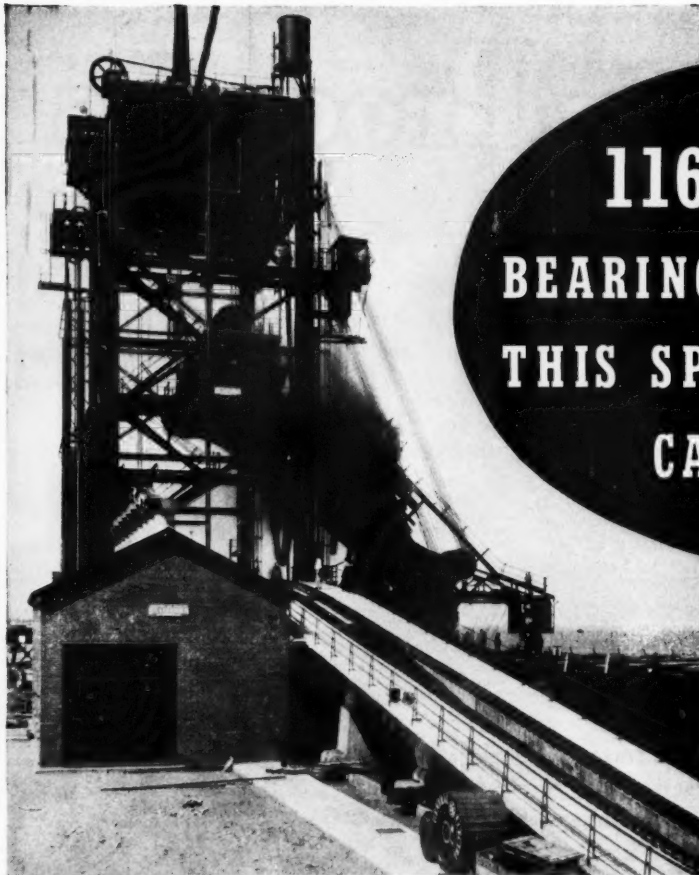
## Exide IRONCLAD BATTERIES

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"MIPOR," Reg. U. S. Pat. Off.



Cut-away Exide-Ironclad cell, showing its unique positive-plate construction, in which slotted rubber tubes retain the active material while exposing it freely to the electrolyte.



**116 TIMKEN  
BEARINGS ARE USED IN  
THIS SPECTACULAR NEW  
CAR DUMPER**

Photograph of dumper taken at the instant of dumping a car.

This coal car dumper handles and dumps one standard railroad car per minute—and does it continuously. It was designed and built by Heyl & Patterson, Inc., Pittsburgh, Pa. for the Pennsylvania Railroad Company and is installed at Sandusky, Ohio, (on Lake Erie) for loading lake freighters.

The entire equipment is electrically operated, four 500 H. P. motors being required to run the loaded car up the incline to the lift, hoist it to the coal pan, dump it and return it to the track. The coal pan mechanism and telescoping chute require another 600 H. P.

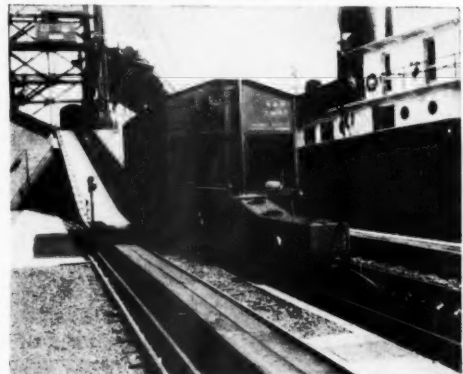
Naturally the bearing service is severe, so TIMKEN Tapered Roller Bearings ranging in size from 3 1/4" to 10 1/4" I. D. are used at all the bearing points in the car barney, cradle and counterweight, telescoping chute and trimmer—100%! Another instance of industry's preference for and confidence in this time-tested bearing.



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Close-up of dumping operation showing some of the Timken Bearing Equipped mechanism.



Timken Bearing Equipped barney pushing loaded car up incline to lift.

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# MINING CONGRESS JOURNAL

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JANUARY, 1940

No. 1

● The unprecedented advance announcement by the State Department that the 4-cent per pound excise tax on imported copper would not be touched in the pending Chilean Trade Agreement marked a signal victory for domestic producers who had demonstrated their strength in no uncertain terms. With a real battle scheduled to be fought over continuation of the Reciprocal Trade Agreement program in the present session, politics no doubt played a major role in the shying away from action on copper.

It would be another healthy, unprecedented move if the damage already inflicted on zinc producers were to be corrected by restoration of the tariff cut made in the Canadian agreement.

● Resumption of negotiations with Canada over the Great Lakes-St. Lawrence Waterway again brings to the fore the vital concern of the mineral industry—notably coal (displacement of present markets by imported coal and fuel oil and by huge hydro-power supplies to be thus made available) and iron ore (threat of cheap, high grade foreign ores competing with Lake Superior ores, and of foreign iron and steel products entering consuming centers) in this long disputed project.

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*Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress*

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## THE AMERICAN MINING CONGRESS

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## REQUISITES OF FREEDOM

A DOCTRINE much exploited by Socialists is that natural resources should not be a subject of private ownership and, therefore, owners thereof are not justified in taking a rental return. This theory is particularly applied to mineral resources, and it is insisted that private owners are not entitled to profits.

If this principle had been applied before investment had been made in such resources, before the large sums which these owners have contributed to the support of government through taxation, a completely different condition would exist. If this rule had applied in the early days of this country the great West would still be undeveloped. The demand for food for miners would not have made a market for farm production. The farms of the West would still be undeveloped because there would have been no available markets, there would have been no traffic to justify railroad building. The gold output of the West would not have been developed by the Government, because it would not have been justified in assuming the hazards of mining, except under some system of slavery.

Had it not been for the pioneer, who on his own initiative produced the gold which saved the nation's credit during the Civil War, it is quite probable that the Confederacy would have been established, and that by this time, perhaps, several other rebellions might have resulted in a number of smaller nations, snarling at each other, as in Europe, instead of our great unified nation.

Private ownership of natural resources has been the corner stone of our national prosperity. Without that development the State would still own these resources, but they would still be in their virgin form, utterly useless to all mankind.

May I repeat the statement that "natural resources have no value until moved from the place of origin." They must be moved before they can be used; removed before having any potency to create a value upon which the financial support of the State can be based.

Coal which is to be mined and marketed this year has a definite value. Coal which is to be mined a hundred years from now has no present value. The taxing of such coal has forced many coal owners to forfeit ownership, after having paid excess prices for title and after paying taxes for many years. When these properties cease to pay taxes the burden is increased upon property which has earning capacity. The late Senator John Shafroth of Colorado used to say that the owners of western property paid for it again every twenty-five years in the taxes paid for the support of government.

Our Federal Government, after years of controversy, enacted legislation for the leasing of coal and oil deposits to be operated on a royalty basis which had the effect of stopping the increase of tax income of the States in which such resources were situated. The operator paid in royalties to the Federal Government what under private ownership he would have paid in taxes to the State.

Government ownership of any property except such as is needed for the purposes of government is a gross mistake.

Government operation of any line of activity which can be successfully operated by private enterprise tends to the creation of unfair competition with private enterprise; to the creation of monopoly; to the reduction of State and local taxes, and is in violation of the fundamental principles upon which the business prosperity of this country is and has been based. Socialism wants to be a part owner in the saving of others, but always changes its view when it becomes the owner of anything worth dividing with others.

Socialism is a beautiful dream on the borderland of nightmare; a theory which, followed to its end, leads either to starvation or to communism, and creates fertile conditions for dictatorship. All property has its foundations in natural resources. All government is maintained by the support of private property. Personal liberty and private property are requisites of freedom.



# MINING CONGRESS JOURNAL

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JANUARY, 1940

No. 1

Richard J. Lund, Editor

## RESIGNATION OF DR. FINCH

**R**ESIGNATION of Dr. John W. Finch from the directorship of the Bureau of Mines, at the request of Interior Secretary Harold L. Ickes, came as a complete surprise, and will certainly be received with regret by the nation's mineral producing industries.

Particularly is this true in view of the Secretary's explanation that the resignation was demanded because Dr. Finch "didn't have enough iron in his blood to run his own bureau." In a press conference following the announcement, Mr. Ickes was quoted as saying, "We are hounded when we have inefficiency in a department and do not seek to rectify it; and now that we have sought to do so we are still hounded." The "inefficiency" presumably refers to a "clique in the bureau which objects to any suggestion from superiors," which Finch "was unable to control."

While recognizing the inherent right of the Secretary to establish general policies in his department, it must be remembered that the Bureau of Mines is the one agency of the Government devoted to the advancement of the science and technology of the mineral industries, to the health and safety of the workers in these industries, and to the assembling of statistics and factual data on their economic relationships. In the work of such a Bureau, intellectual integrity is a primary essential. Any encroachment thereon, through requiring submission of data in such form as to support and advance preconceived ideas on conservation or other policies affecting mineral resources, comes perilously close to dictatorship.

In the words of an *Evening Star* (Washington) editorial:

"The only logical explanation of the mystery is that in this and other incidents in which the energetic Secretary has been involved, the possession of such meritorious attributes as iron in the blood, true liberalism, sympathy for the downtrodden, common honesty and a respect for the Ten Commandments is contingent upon the ability to agree, first, last and all time with the Secretary of the

Interior. If you agree with him, you have iron in your blood and ginger in your nervous system and sweetness in your heart. If you do not agree with him, you lack not only iron in the blood and other graces but are, in addition, a pain in the neck to the Secretary."

Also, to quote from an editorial in the *Washington Post*:

"If he (Dr. Finch) lacks 'iron in his blood,' as Mr. Ickes vaguely asserted yesterday, the anemia has heretofore been very successfully concealed.

"Moreover, judging from what the Secretary says for publication, the difficulty seems to be just the opposite of any lack of vitality on the part of Dr. Finch. The Bureau of Mines, complains Mr. Ickes, is not as subordinate in its thinking as he believes should be the case. And this certainly fits in with the general impression that with Dr. Finch on the job, the Secretary has been unable to extend a personal dictatorship over the Bureau of Mines to the extent obvious in other agencies of the Interior Department."

We believe the mineral industry subscribes whole-heartedly to the thoughts so pungently expressed by the Washington press. In an organization dedicated to the purposes outlined above, initiative and original thinking are qualities eminently to be desired. That Dr. Finch has been notably successful in encouraging those very qualities in his organization is a sign of leadership and strength, rather than of any deficiency in hemoglobin.

A major source of friction is reported to have been the Bureau's failure to see eye-to-eye with Mr. Ickes in his strong advocacy of the Neely Bill calling for compulsory Federal inspection of coal mines—action on which is still pending in the present session of Congress. Such a law could easily be used as a "big stick" to force acquiescence by objectors to the Guffey Law under Mr. Ickes' administration.

After one press interview following announcement of the Finch resignation, Mr. Ickes left suddenly and unexpectedly for an unannounced Florida retreat, where, as this is written, he cannot be reached to clarify his untenable, tangled position revealed so vividly by Washington's alert press.

Dr. Finch may well be proud of his six-year stewardship of the Bureau of Mines, during which he has earned universal admiration for the manner in which he has improved the Bureau as an agency of service to the mineral industry and those employed therein. His departure from office under the present circumstances enhances the respect in which he is held by mining men throughout the nation.

Breakers such as this dot hills and valleys throughout the Pennsylvania anthracite region

# ELECTRICAL POWER

## in the Anthracite Industry



A POPULATION of one and one-half million is dependent upon the anthracite coal industry, and 97,000 workers are employed to mine and clean the product. Each day the mines operate, they produce more than \$1,000,000 worth of coal. The value of the anthracite coal tonnage per year is more than the value of all the gold produced annually in the United States.

The original deposit of anthracite coal has been estimated to contain 20 billion tons, of which 10 billion tons are still recoverable. If the present rate of mining is continued, the coal now in the ground will be mined during the next 150 years. Due to its location, so near the New England area and the eastern seaboard, this vast supply of fuel has materially contributed to the industrial development of those sections. In 1923, the Engineer's Advisory Committee of the United States Coal Commission placed a valuation of \$989,000,000 on the anthracite coal lands, plants and improvements.

When anthracite coal was first mined, and for many years thereafter, steam engines supplied the necessary power. Steam was generated in boiler plants located at each mine, and many of them contained in succession, cylinder boilers, return tubular boilers, and the modern water tube boiler. Pipe lines, many of which were over a mile long, conducted steam to isolated hoisting and pumping plants.

\* Presented to American Institute of Electrical Engineers, Scranton, Pa., October 11-13, 1939.

- ***Broadly Applied from Face Through Breaker, But Since Full Load Exists During Working Period, Load Factor Is Low Compared with Other Industries—Between 30 and 50 Percent***

By W. H. LESSER  
Electrical and Mechanical Engineer  
Pierce Management

The over-all efficiency of the early hand-fired grates, low pressure boilers, and leaking steam lines was indeed low.

Much pioneering was done and many problems were solved in the application of electricity to coal mining equipment, because a great part of it is located in the mine and is, therefore, subjected to moisture laden air and corrosive water. Credit is due to the manufacturers of electrical apparatus for the development of equipment to operate satisfactorily under the adverse conditions found in mines.

### Haulage

A mine with 40 miles of track in which 1,000 cars must be transported in seven hours to a central point presents a problem quite beyond the scope of mules, the first motive power utilized in mines. Under such conditions, it is quite evident that mechanical haulage is imperative if production is to be maintained.

The trolley mine locomotive was first used in anthracite mines in 1887, and its introduction started a rapid decline in the number of mules required. During 1905 there were

Steam generated in boiler plants at individual mines furnished power for many years after anthracite was first mined. Pipe lines as long as a mile carried the steam to isolated hoisting and pumping plants





17,500 mules in the anthracite coal mines. Mine locomotives were the highest in 1926 when the total was 2,300. At the present time, the haulage equipment in the anthracite industry comprises 1,860 trolley, 271 battery, 289 steam, 48 compressed air, 13 gas locomotives and 6,000 mules.

Engine driven direct current sets of 250 volts first supplied the necessary power for the locomotives, but now, rotaries and motor generator sets, some of which are automatically controlled, constitute the conversion equipment.

Trolley locomotives weighing eight tons seem to be the popular size, while 20-ton machines are required on heavy grades. In gassy mines, storage battery locomotives avoid the dangers of gas explosions. Interruptions in the power supply to haulage systems are reduced by automatic reclosing circuit breakers which sectionalize the circuits.

Railroading in the larger mines has become so dense that comprehensive dispatching systems are necessary. Telephones are used to distribute cars, and block signals move the trains over the roads—all of which make the car dispatcher an important entity in a mine organization. According to the Pennsylvania Department of Mines, there are 75,000 miles of gangways and other openings in the anthracite mines.

### Ventilation

A continuous supply of fresh air to the mine worker is of prime importance, because without it, life in mines would be impossible. Gases liberated from the coal must be diluted and rendered harmless.

The movement of 659,000,000 tons of air per year (13 tons of air per ton of coal shipped) involves the solution of many problems. So important is the operation of mine fans that in some installations emergency driving units are installed to operate them in case of a power failure. They consist of a gasoline driven engine which automatically starts after a power failure, and in 35 seconds operates the fan at normal speed.

Slip ring induction motors are generally used to drive the large mine fans. They are equipped with magnetic starters capable of starting on the return of power after an interruption. Overload, phase failure, bearing temperature and low voltage relays complete the protective devices. Although engineers have realized the



Three 8"-6 stage fully automatic pumps handle 6,000 g.p.m. with 695 ft. head at this operation

advantages of synchronous motors on mine fans, the number of applications to date represent a small proportion of the total motors driving mine fans. Direct current or squirrel cage induction motors drive many small fans distributed throughout a mine.

Motor speeds are reduced by belt drives, silent chains, enclosed spur gears and the multi-V-strand belts.

Fan engineers have kept in step with the drive for more efficient fans. The modern high speed fan has an efficiency of 87 percent compared with 65 percent for the old type of fan.

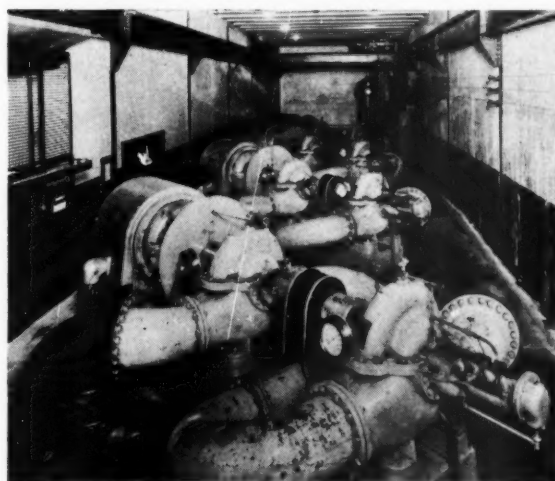
### Pumping

Prior to advent of electrical pumping, the mines were kept free of water by steam pumps, the most efficient from a steam consuming viewpoint being the compound and triple expansion, condensing, horizontal duplex pump. Water hoists operated by two drum steam engines located on

the surface were also used—2,400-gallon tanks on each rope raised the water to the surface.

The first electrically operated mine pump was installed in 1891. It was a vertical triplex pump operating at a nominal head. Horizontal electrically operated duplex pumps have been used under certain conditions, but the centrifugal all bronze pump, first used in about 1904, now handles most of the water produced in the mines and that required in the cleaning processes.

About 20 to 30 tons of water per ton of coal produced are pumped from the mines and through breakers, and at certain properties these figures are greatly exceeded. The abandonment of many mines allows the water to flow into adjoining properties where a real pumping problem must some day be solved. One of these plants contains four pumps with a total pumping capacity of 20,000 g.p.m. against a head of 270 feet. Several large pumps are each driven by a 1,000 horsepower squirrel cage motor which is thrown directly across the line when starting. The squirrel cage motor is the type commonly used on mine pumps,



A modern pump room in an anthracite mine. From 20 to 30 tons of water per ton of coal produced are pumped through the mines and breakers—sometimes even more

but synchronous motors have been installed in some instances for power factor correction.

Many mine pumping plants are automatically controlled, the start and stop being effected by float switches or electrodes. Where more than one pump is necessary, sequence starting and stopping have been adopted. The protective devices usually utilized are those designed to stop the pump if the discharge line breaks, if the suction line takes air or blocks, and if the bearings get overheated. Time clocks and load limitors make it possible to put the pumping load on the power lines during the off peak periods, thereby obtaining a better power rate per kilowatt hour.

Local dips and basins are kept free from water by portable pumps designed for small capacities and low heads. Both reciprocating and centrifugal pumps are utilized in this class of pumping.

### Hoists

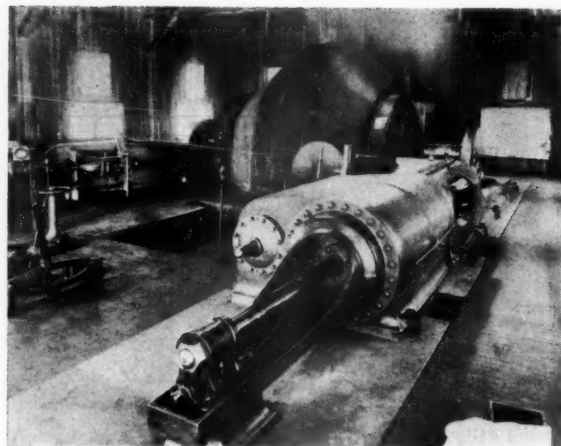
Electrically driven hoists appeared in 1896. The first hoist installed was driven by a direct current 500 volt

Many modern steam hoists are still operating successfully

acceleration and speed control and a maximum torque switch for foot operation. Safety devices stop the motor and apply the brakes in case of overspeed hoisting and overtravel. The largest hoist motor in the region is 1,500 horsepower.

In addition to the large hoists, there are many slow speed small hoists operated by either direct or alternating current motors. They move cars from dips, and spot cars under loading stations.

Many modern steam hoists are still in operation. Those on shafts with large capacities will have 45-in. x 60-in. cylinders and 14-foot drums.



One of the most modern electric hoists in the anthracite district

motor with a straight rheostatic control. Today, most of the large shaft and slope hoists are driven by alternating current motors with a voltage of either 440 to 2,200 volts. A typical shaft hoist is equipped with a slip ring induction motor designed for plugging service. The accessories consist of the following: An incoming line oil circuit breaker panel, a primary reversing panel, a secondary accelerating panel, grid resistors for

Some collieries are completely electrified with the exception of the hoists. Their high installation cost and adverse effect on the load factor and power rates are the possible reasons.

### Breaker

Anthracite coal coming from a mine is unsized, and it contains much slate and rock. The impurities are removed and the coal is sized in a

breaker where considerable electrical power is required to drive crusher rolls, shakers, conveyors and coal cleaning machinery. The use of electrical power in breakers dates from 1902, when one was built containing direct current motors at 250 volts. Today, alternating current motors supply power to the breaker equipment. Generally speaking, the group drive has been adopted. Motor speeds are reduced by belts, gear reducers, V-belt drives, or chain drives.

Slip ring induction motors have been used during the past, but now high torque squirrel cage motors are being generally applied. Motor controls are the magnetic type with start and stop push button stations located near the machinery driven by the motor. Controls are interlocked so that sequence starting and stopping are possible, thereby preventing one group of shakers from piling coal upon shakers not started. One large breaker in the anthracite field contains 7,000 horsepower motors for an eight-hour tonnage of 10,000 tons.

Power factor correction may be obtained through the use of synchronous motors for driving breaker machinery. An installation of that type consists of a 200 horsepower motor driving its load through a magnetic clutch which is also used to apply the load when the motor reaches full speed. Coal feeding equipment of the reciprocating type is driven through magnetic clutches which allow frequent starting and stopping without interrupting the other equipment.

### Electric Shovels

The steam shovel is the latest piece of mining equipment to surrender to electrical power.

When the electrical drive was first placed on shovels there was much discussion as to whether the proper equipment should be alternating or direct current. This period of pioneering is now history, and the Ward Leonard control with the separately excited, sometimes called Shunt motor, has become universal for the larger type of shovel. The complete movement of the bucket consisting of digging, hoisting, holding and lowering is accomplished by motors without the use of clutches. All the braking operations are accomplished by regeneration which makes it possible to return power to the line when the swinging parts are stopped or the dipper dropped.

Power is brought to the shovels in the form of alternating current, 440 or 2,200 volts, through rubber protected three-conductor cables and collector rings. The motor driving the motor generator set is usually the across the line induction type started either magnetically or manually.

#### Mechanical Loading

During the past 10 years, much progress has been made in the anthracite field in the mechanical loading of coal. Its adoption results in lower mining costs, especially where coal is mined from seams 30 inches thick. In 1930, there were 3,800,000 tons mechanically loaded and now this figure has increased to 10,000,000 tons. About 20 percent of our tonnage at the present time is loaded by mechanical equipment. Conveyors, both the belt and flight types, are important accessories in mechanical loading projects.

Shaking chutes discharging into the mine car, or a conveyor, have been the popular types of loading equipment. They are generally driven by direct current, 250 volt motors, interlocked so that sequence starting begins from the discharging end of the equipment. Belt conveyors 1,500 feet long receive coal from the various shaking chutes or flight conveyors, and convey it to a central loading station.

The need of mechanical loading equipment becomes more obvious as time passes, due to the exhaustion of thick beds of coal and the necessity of mining coal from thin seams.

With the mining of thin coal came also the electrically operated coal cutter, usually driven by 250 volt direct current motors. There are about 250 coal cutters in the region with a total horsepower rating of 12,500.

Draglines such as this, and large electric shovels are important power consumers in the extensive stripping areas



#### Air Compressors

Compressed air is an important class of power in practically all mines, because it is used to operate rock and coal drills. The typical station compressor is driven by a synchronous motor. Portable compressors, capable of being moved from one section of a mine to another, are much smaller than the station type, and many of them are driven by direct current motors from the haulage circuit.

#### Transmission of Power

Most of the power used to mine anthracite coal is supplied by the public electrical power companies. Each mine has its step down substation with an incoming line voltage as high as 66,000 volts. There the voltage is reduced to 2,200 and 440 volts, the

former voltage is used in the large electrical motors such as hoists, pumps, motor generator sets and air compressors. The 440 volt circuits supply the smaller motors. At large collieries with heavy loads, the power companies have made it possible to get power from two circuits, thereby improving the continuity of service.

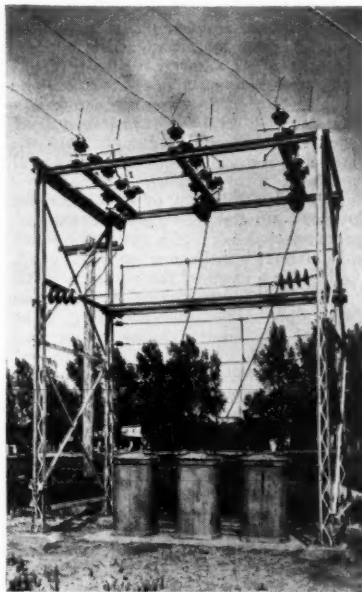
Power is taken into the mine through slopes, shafts or boreholes. For delivering large blocks of power to the inside of a mine at 2,200 volts armored three conductor cables are used. The wires are cambric or rubber insulated, lead sheathed, jute filled with a wire armor and a jute and asphalt cover. Power is transmitted throughout the mines by cables or wire suspended on insulators attached to props. Some 2,200 volt cables are buried in a trench of a suitable depth close to the rib.

#### Lighting

One of the outstanding contributions to the mining industry during the past 25 years is the application of Thomas A. Edison's nickel-iron-alkaline storage battery to the miner's electric cap lamp. About 400,000 of them brighten the gloom of the mines. They have a lighting value of 66 candlepower for 10 hours, and supply seven times more light than the lamps commonly used.

Reduced accident rates, increased production and a general increase in the efficiency of the mine worker usually follow the adoption of electric cap lamps. In mines where much inflammable material is found, they reduce the mine fire hazard.

Electricity contributes its part in the development of devices for the protection of men working in coal mines. The portable methane detector utilizes the following principle: The air to be tested is drawn into the



Electricity is generally supplied from large central stations, with step-down substations at each mine



tester by a small hand operated plunger type pump, and it then passes over a hot platinum wire that forms a part of a balanced electrical circuit for which power is produced by two small dry cells. Combustion of the gas on the surface of the detector filament creates an increase in its temperature and a consequent increase in its resistance which unbalances the electrical circuit. This unbalancing of the circuit causes a deflection of the pointer of an electrical meter over a scale calibrated for gas concentrations.

### Conclusion

Electrical engineers of the coal mining companies have been alert to the power savings possible when high power factors are obtained. They have used synchronous equipment on drives where the load permits their installation. Many capacitors are operated at plants where low power factors cannot be obtained from the synchronous motor driven equipment.

Due to poor working time and lack of synchronous equipment, some mines have power factors as low as 60 percent. Capacitors and many synchronous motors raise that value to 90 percent and above.

Since the full load at an anthracite mine exists during the working period, seven hours per day, the load factor is low when compared with many other industries. Better load

factors are possible when heavy pumping, compressed air, and ventilating loads exist, and especially when the inside is worked two 7-hour shifts. The average anthracite coal mine load will have a load factor of between 30 and 50 percent.

Available data indicate that equipment requiring the development of 950,000 horsepower is necessary to mine the present anthracite coal output, of which 79 percent (750,000 horsepower) is in the form of electric motors and 21 percent (200,000 horsepower) is developed by steam engines. Not all of this electrical power is supplied by public electrical power companies; some of the coal mining companies generate their own power, and their plants are modern in every respect.

A survey of the present power requirements of the anthracite industry shows an annual consumption of 990 million kilowatt hours of which 62 percent (614 million kilowatt hours) are purchased from the utility companies, and 38 percent (376 million kilowatt hours) are generated at plants operated by the mining companies.

If the entire industry were completely electrified, the production of 44 million tons of coal would require an estimated annual generation of 1,100 million kilowatt hours with a demand of about 250,000 kw.

The successful application of electrical power to mining equipment represents a noteworthy achievement of the engineers in the mining industry, the manufacturers of electrical apparatus, and the public power companies. Without this development, the present production under the existing mining conditions would hardly be possible. Similar pioneering still continues in the engineering of anthracite coal mines. The frontiers of coal mining technique are still being pierced, and this must necessarily be done if the tomorrow is to be better than the today. Engineering developments have doubtlessly increased the ability of the industry to resist the shocks of adversity concomitant with the present adverse economic conditions existing in this country. Unfortunately, not all the problems having to do with the profitable operation of the mines are amenable to a solution based upon physical laws, scientific principles and engineering developments. Labor problems, diminishing returns, deeper and more expensive mining, taxes, competition, production quotas and unprofitable selling prices are problems still to be solved, if the industry is to prosper, and they will be solved only through the optimal cooperation of those leaders so vitally interested in a prosperous anthracite coal industry.

### Koppers Research on Stoker Coals

A permanent program of investigation and research work in connection with the stoker coals produced by The Koppers Coal Company was recently announced by Walter Rothenhoefer, general manager of sales.

Walter Knox, formerly with the Stoker Division of Fairbanks, Morse and Company, Armour Institute and the Whiting Corporation, has been employed to carry on this work. He has had several years of practical heating experience and is a graduate of the University of Illinois with a Bachelor of Arts degree and a Bachelor of Science degree in Mechanical Engineering.

A special laboratory is being equipped at the Seaboard plant of Koppers Company, Kearney, N. J.

The project will be supervised by J. D. Doherty and will be an activity of the Research and Development Division headed by Fred Denig, vice president of Koppers Company.

In discussing the need for such investigation at the recent convention of Stoker Manufacturers Association, Mr. H. J. Spear, assistant general sales manager for the Koppers Coal Company said:

"The stoker industry should look to the coal man to broaden his understanding of the use of the different types and kinds of coal now on the market. Valuable research work has been carried on by Bituminous Coal Research, Inc., coal associations, railroads and individual operators, as well as others interested in the development of this division of our business. However, most of it, with an occasional exception, has been of a general nature and, although filling a definite need, has hardly scratched the surface. With the increasing commercial importance of the domestic stoker industry, it is essential that more concentrated and detailed work of this kind be carried on by, or under the sponsorship of the producer himself. If the stoker manufacturer or distributor cannot look to the producer for the true facts regarding the use of his particular coal, or coals, to whom else can he turn? I cannot help but feel that many of the misunderstandings which have crept into the relationship between the stoker manufacturer and the coal producer can be directly traced to the former's lack of knowledge of coals and their individual characteristics, and our own inability to furnish accurate and factual information."

While Mr. Spear states that it is impossible to completely detail all of the directions which this stoker coal investigation will take, since it is to be a permanent and continuous activity, it is announced that some of the subjects will include studies to:

Determine practical ways of eliminating common difficulties, study the adaptability of new coals for stoker use, make investigations of various types of treatment, determine the factors influencing coke formation, study means of controlling coking tendencies, determine fusion ranges suitable for domestic underfeed stokers, investigate effect of different feed and air settings upon individual coals, study overdraft needs of different coals, study means of minimizing or eliminating flyash, study the mixing of different coals toward improving burning characteristics, consider further improvement in preparation and sizing, accumulate actual data for some standardization of firing instructions and check burning characteristics of competitive coals.

Anthracite mines in the United States have operated for more than 18 months without a major disaster.



# Progress in MILLING PRACTICE and EQUIPMENT

**P**ROGRESS in mineral dressing has been by long and rapid strides, and almost every day mineral technology is on the march. In view of the ever increasing difficulty of showing profit at mining, the engineer, for his own survival, has had of necessity to reduce operating cost, recover more, and make better products.

In a general way, the continuously improving technology is the result of operations primarily on four fronts. First, and in my opinion of greatest importance, research and testing in the laboratory; second, ingenuity in setting up flowsheets and devising processes; third, improved equipment; and fourth, availability of better materials and methods of fabrication.

## Importance of Research Stressed

I prefer to emphasize the importance of research rather than any one of the other three fronts above cited. Testing is a routine thing, but when done by a trained, alert, observing mind may, and often does, lead to fundamental discoveries of far reaching importance. Much credit is due the machine designing as well as the plant designing engineer, but, although new machines appear over night, most of them are mechanical variations of an older machine which had the original idea—seldom does a new machine appear embodying new and fresh fundamentals. In machines one, of course, finds good and bad engineering. Good engineering naturally leads to improved operating economy and almost inevitably to improved metallurgy. Steel fabrication by electric welding, the employment of the texrope drive, and the use of antifriction bearings are the most important embodiments of the modern machine.

The availability to the designing engineer and the metallurgist of better and better materials leads to improved operating economies and in some cases even to the solution of

## ● Improved Technology Results from Research, Ingenious Flowsheets and Processes, and Improved Equipment Involving Better Materials. Importance of Research Stressed.

By A. W. FAHRENWALD

Dean, School of Mines,  
University of Idaho

long existing unsolved problems. A few instances may be cited. The use of rubber in equipment required to withstand chemical corrosion and severe mechanical abrasion; the use of stainless steel where the combination of strength, resistance to chemical action and mechanical abrasion are needed. For a concrete example, I might cite the experiment conducted in 1938 at the concentrator of the International Nickel Company of Canada, Ltd., Copper Cliff, in which the relative merits of the screen and the classifier, in closed circuit with the ball mill, were tested. In addition to the property of the stainless steel screen to resist wear, due to its immunity to oxidation processes, it resisted "blinding"—a combination of properties not previously available in any other relatively inexpensive material.

The capacity of the operating engineers to concoct ingenious flow sheets and pulp treatment sequences has been outstanding. Results of this type of engineering in the form of increased profits are to be seen in the concentrating plant, in the leaching plant, and in the smelter.

## Proof of Research Importance

Getting back to research, I wish briefly to offer proof of its importance. Take first the photoelectric cell. This little gadget is used in numerous ways in the steel industry where it controls

operations with precision and accuracy beyond human skill, reliability and endurance. It is embodied in instruments for measuring temperatures, for measuring sedimentation



A. W. Fahrenwald

rate, in the cement industry indirectly for measuring particle size and surface, and in cyanidation for detecting the presence of sediment in gold solutions. In the cyanide process, progress has been made around the better knowledge of the basic importance of oxygen. The Crowe process of deoxygenation of gold-cyanide solution prior to zinc precipitation was a marked forward step. The recent laboratory researches relating the effect of atmospheric pressure upon the rate of gold dissolution open the way for future progress.

In flotation, it was to a large extent the researches of Dr. Laugmuir in 1917 that laid the scientific foundation for the technologic development that followed. He gave the key to intelligent explanation of surface reactions. The concept of heteropolar molecules and of molecular orientation at surfaces is the basis of the theory of frothing, wetting, emulsification and of the oiling of mineral surfaces. In the early litigation surrounding development of the process,

the experts who gave testimony, and the learned judges who upon this testimony made decisions involving millions of dollars, must now be restless in their graves—or in their armchairs if they are still alive. Contrast, for example, the mysteriousness that surrounded the early study of the floating needle and that of sinking of the duck by the use of a dab of one of the modern wetting agents.

Then in crushing and grinding there is the research which led to proof of Rittinger's law of energy distribution; the law of size distribution; the formulae relating ball mill capacity, energy consumption and mill diameter; the research on grindability of minerals and circulating loads.

Innumerable examples of the role of research in the march of mineral technology could be cited.

### Comminution Fundamentals and Research

In the processing of ores the purpose of comminution is to unlock all or certain of the mineral entities, or in wet metallurgy to unlock and expose. Technically and economically it is a surface-making operation. In practice, the problem is to accomplish the above named purposes in a product of minimum surface content.

Comminution for many years went ahead on an empirical basis, eventually slowed down to again go forward under the guidance of science.

In building the technology of crushing and grinding, the microscope has played an almost indispensable role. The skilled use of this instrument has made possible such determinations as (1) the mesh of grinding to effect practical and economic liberation, (2) particle number and surface distribution in a crushed product and (3) mineralogic composition of ores and ore-dressing products. Great credit is due those who led in the development of the microscopic techniques in the field of mineral dressing.

Comminution was placed on a more scientific footing when in 1925 Martin and his co-workers in England, and Gross and his associates at Salt Lake, independently and nearly at the same time gave proof to the "law of energy distribution" propounded, but not proved, by Rittinger in 1867. We now know that the energy expended in crushing rock is proportional to the new surface produced. Since surface is proportional to mesh, or re-

ciprocal of diameter, we have been sharply brought to realize that most of the crushing cost goes into production of sub-sieve sizes—in many instances finer than necessary for metallurgical needs. Everything is done now to effect complete mineral liberation with the minimum of over-grinding.

Research in crushing and grinding in the laboratory has been voluminous and brilliant. In 1926, research produced what is generally called the "Law of size distribution." Martin put forth the following law: "The number of particles produced increases with increasing diameter according to the compound interest law." In other words, the number of particles grows with increasing fineness in the same way that money grows when let out at compound interest.

Gaudin stated ("An Investigation of Crushing Phenomena," A. I. M. E. Trans., Vol. 63, 1926)—"If a sized product composed of structurally homogeneous rock grains is crushed, a product results in which the relation between the percentage weight of grains of various sizes and the sizes themselves follows a definite law." When the cumulative screen analysis is plotted upon the log-log diagram, the curve is an approximate straight line. When plotted with arithmetical coordinates the curve is that of a hyperbola.

There have thus been developed scientifically sound methods of studying machine performance. With these tools in hand, extensive and detailed studies of comminution processes have been made.

### Coarse Crushing

It is well known that coarse crushing costs are relatively low. This is because relatively an insignificant amount of surface is produced. It is true, however, that coarse crushing costs are much greater per unit of new surface produced than in fine-grinding. This is due to high bearing friction as a result of the tremendous unit stresses involved. The use of antifriction bearings in some machines has resulted in large savings in operating costs. Their application here, however, results in higher purchase costs.

In the coarse crushing range, probably the outstanding development of all time was the long-stroke, high-velocity-of-hit, cone crusher. This crusher, requiring controlled feed, by virtue of its principle of action, pro-

duces a minimum of undersize. More credit is due the inventor of this machine than is generally accorded him. By these remarks, I do not wish to convey the thought that it is the embodiment of perfection and that its use always is to be recommended. Every good machine and/or process constantly is being threatened in its supremacy. That is true now. Several new machines for which much is being claimed are now in the field undergoing the test of competition. In the case of one of these, typified by the absence of a fixed jaw, in which crushing is effected by direct pressure, astounding claims are made. It would appear to be the crusher man's utopia. It is claimed that steel wear is insignificant, power consumption a minimum, and that it permits reduction of run-of-mine to ball mill feed size in one pass. It is barely possible that here is the embodiment of new principles. The principle of action in this machine is the antithesis of that of the cone.

It is an interesting fact that little laboratory research has accompanied the development of the crusher; at least, not much has been published.

The development has been on the drafting board and in the plant, and, it might be added, at great cost. The "rodents" of the crusher are poor lubrication, dust, poor bearing design and type.

### Rock Crushing with Rock

There has long been the desire in the milling of ores to avoid and minimize steel consumption. To this end, the rock mill in one form or another has been tried, and again at great cost to the brave-hearted sponsor. This process, not a success to date, should not be given up as having no possibilities. Unfortunately, attempts have been made to do work with this type mill almost exactly that which earlier the ball mill failed to do, namely, comminute in a single stage from mine run to mill feed.

A Seattle manufacturer now advertises a rock mill built in sizes from 6 to 20 feet in diameter and of variable length. It is drum-shaped and provided with four lifting shelves within the drum. The ore is picked up, lifted and allowed to fall on ore below as the drum revolves.

There is, of course, no objection to single stage rock reduction, and in fine-grinding that can and is now being done. This has been made possible by the availability now of crushers

capable of making a quarter inch mill feed.

The rock mill per unit of volume, just as in the case of the pebble mill, which is itself essentially a rock mill, can never compete with the ball mill with its heavy, potent grinding media.

As competitor of the fine reduction crusher, including the rolls crusher, the short, large-diameter mill employing large-diameter cylindrical, steel grinding media, offers promising possibilities. In some recent research in our laboratories, I have been astounded at the capacity of a 4-inch by 18-inch mill, one-third loaded with 2½-inch rods, to reduce quarter inch and coarser feed to minus 48 mesh product.

### Closed Circuit Grinding

Trends in ball mill grinding have been toward larger discharge ends, higher speeds, smaller ball and pulp loads. Mill speeds above critical, while shown to increase materially mill capacity, resulted in excessive liner wear. The increased grinding was the result of increased ball-spinning imparted by the liners. This process swiftly abraded steel, and nothing could be done about it. Many liner materials were tried. In practice, speeds are not likely to exceed 85 to 90 percent of the theoretical critical, and a number of mills now in operation approach this speed.

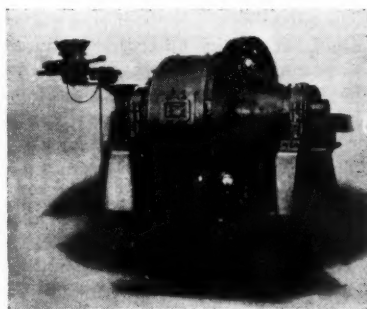
The experimental proof that mill capacity is proportional to the 2.6 power of the diameter has encouraged tremendously the use of larger mills. One large mill produces more surface units per horsepower, day or hour, than two small mills whose combined volumes equal that of the larger mill. Neglecting bearing friction, other factors being equal, mill capacity and power input are proportional and independent of mill size and design. The combination of factors, not including bearing friction, causing a mill to consume the maximum power also proves to be that condition for maximum mill capacity.

Much has been done to maintain in the ball mill sand loads of maximum unfinished sand-surface. To this end, stage grinding, low pulp level and moderately high circulating loads are maintained.

Single-stage grinding is again increasing in popularity. This is because, as pointed out above, it is now possible to provide the ball mill with finer feed. Rapid pass of pulp

through the mill, made possible by use of large discharge ends, with resultant frequent classification and moderately high circulating loads, are other factors. The single stage process also is easier of operation as well as more economical of floor space. Thus, progress goes forward not steadily but "steady by jerks."

The form of the ball mill has not been found to be a significant factor. The power required to operate a ball mill is a safe criterion of the potency of that mill. Of two mills operating on the same feed, the one taking the greater power may safely be presumed to be delivering the greater output of finished product. There is, of course, a best set of conditions for any mill for optimum output. These conditions may or may not be embodied in any operating mill. Much systematic experimentation is required to obtain this critical set of conditions. Once found, however, great economy is to be effected by maintaining constant these conditions. This has been recognized, and accessory gadgets now are available for control of the classifier



"Electric ear" for maintaining best conditions in ball mill for optimum output

and of the ball mill itself. Ball load, feed load and water conditions all may now be placed under automatic control. The ball mill is controlled on the basis of the noise it makes by employing the "electric ear," and the classifier by the pulp density.

### Classification, Water and Sizing

In modern milling, classification is an integral part of the grinding process. It plays an immensely important role in the whole scheme of mineral dressing. In grinding, it is the direct function of the classifier to remove finished material from the pulp-stream discharging from the ball mill. Because the capacity of the mill to produce finished product is determined largely by the rate of flow of un-

finished sand into the mill, there is a demand upon it to handle tremendous sand loads. The operator would like a classifier capable of returning these large sand loads free of finished sizes. No classifier does this, and of consequence the feed to a ball mill always is a composite of two kinds of material, one finished and the other unfinished. The classifier is good or bad, all other factors being equal, in accordance with its ability to remove the finished part. Of course, the classifier overflow also must be relatively free of oversize. Large circulating loads, and the plunging into the classifier of large volumes of pulp, lead to trouble in just this respect. Circulating loads seldom exceed 500 percent.

In many feeds, it is, of course, theoretically impossible to exclude from the classifier sand all finished sand. Actually this is true in the case of nearly all ores since they generally are aggregates of a small percentage of heavy mineral or minerals (usually the valuable ores) and of one or more lighter minerals. The laws of hindered settling and of crowded settling are at play, and hindered and crowded settling size-ratios obtain. Nothing much can be done about it practically. This situation, however, is not always disadvantageous. In the case of complex ores requiring fine grinding to effect mineral liberation, the relatively heavy, locked middling grains remain in the mill-classifier circuit longer. They leave the system via the classifier only when they are broken into small pieces. There are cases, however, when grinding economy and metallurgical efficiency would be greatly enhanced if the return sand to the ball mill were subjected to a sizing classification to remove from the mill-feed finished, free mineral sand. Much of this eventually is overground resulting in useless power consumption, reduced mill capacity and eventually (in some instances) mineral loss, to say nothing of reduced capacity in the concentrators, filters, etc., and higher reagent consumptions.

In view of the recent test at the concentrator of the International Nickel Company of Canada, Ltd., screening in closed circuit with the ball mill, using stainless-steel wire, would appear not to be impractical. The operating cost of screening in the classifier-mill circuit would need comparison to the costs and losses due to overgrinding. Other items, particularly dilution problems, would come



up for consideration. The removal of finished mineral-sand dragged back to the mill by the classifier is being accomplished by various concentration methods discussed below.

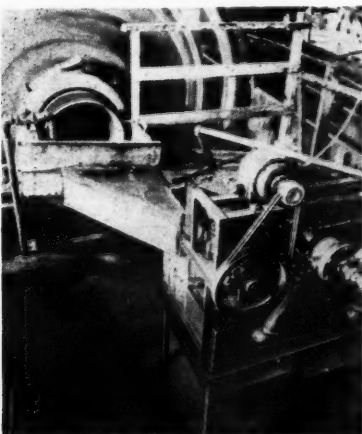
Nothing particularly new in classifier machines has been seen. Old principles of operation are being embodied in new streamlined designs. The rake and screw types have no competitors. The bowl-type classifier in the fine-grinding circuit has appeared in several modifications of its original form. There is, however, little new in principle. To the writer's knowledge, there is little or no research in this field.

### Gravity Concentration, Stratification

The physical limitations of gravity methods are well known. Minerals of equal or nearly equal specific gravity obviously cannot be dressed. Neither can a separation be made of mineral feeds of sub-sieve sizes even though there may be considerable spread in specific gravity. The small particles have too much surface for their weight to possess practical settling and stratifying capacity.

The well known and long-used machines, however, have by no means been squeezed out of the picture by flotation. They continue to serve, to a limited extent, their original purposes, and during recent years have found useful new positions in milling flow sheets.

The jig and the table, both old-timers, but dressed in modern designs, are finding regular and increased use in the mill-classifier circuit. The jig, using an artificial bed, makes hutch-concentrate only. These ma-



Jigs dressed in modern design are finding increased use in the mill-classifier circuit

chines take out of the circuit free gold and sulphides, the result being improved economy and metal recovery. The jig has become very popular, and in a number of plants has replaced blankets, corduroy tables and amalgamation. Blankets and corduroy are being used at many different places to take out free gold. It is now perfectly obvious that concentration in the early stages of modern fine-grinding practice leads to increased profits and mineral conservation.

Mineral dressing by use of parting (heavy) liquids, until recently only valuable in the laboratory, seems to be headed for a place in the commercial plant. The application of this process is being made possible through cheaper production of parting liquid such as tetra-bromo-ethane ( $C_2H_2Br_4$ ) and through the use of surface-active agents which immunize the solids against the parting liquid. The method is not applicable to fines. On feed size from  $\frac{3}{8}$  inch to  $\frac{1}{4}$  inch, the estimated cost is around \$0.25 a ton.

Since the development a number of years ago of the Chance process, heavy suspension is now employed for concentrating zinc ores. Using galena, a pulp of density up to 3.8 maximum is possible. These very dense pulps, however, are too viscous for practical purposes, and it is necessary to use diluted, more fluid pulp. Many technical problems are encountered in this type of process.

Another process, half gravity and half flotation, usually referred to as "oil agglomeration with tabling," is one of the most interesting newer developments. Dressing is effected on the Wilfley table by selective mineral oiling. The oiled mineral particles, in a feed to be thus treated, agglomerate, float on the pulp-bed on the table, and are washed therefrom by the cross-water. This process applies only to relatively coarse sands.

### Thickening and Filtration

In thickening, there is nothing new in principle. Mechanically, machines have been much improved. A recent development in the "washing tray thickener" has come more widely into use. It may, with a number of advantages, be used in lieu of the Standard C.C.D. System. In cyanidation, it might be said that there are two schools of practice. The counter current decantation method has given way in some districts to repulping and double filtration, using drum and disc

filters. This practice also leads to greatly reduced space requirements. Filters now employ shallower pools than previously, have better means for maintaining pulp-suspension, and provide longer drying and washing arcs. Relative to thickening practice, it is noteworthy to call attention to the marked improvement in the diaphragm mud-pump.

### Flotation

Flotation has made astounding progress. For this, research is largely responsible. Not only can most minerals be floated, but flotation has played roles in other ways than merely to concentrate. In one type of milling, flotation actually performs as a classifier—a type of classification, however, impossible of attainment by use of water or screens. It does this in the gold mill treating an ore in which the gold values are largely intimately locked in sulphide grains. The pulp stream at a relatively coarse grind is subjected to flotation. By this treatment, the pulp is divided into two parts: (1) sulphide carrying the bulk of the gold, and (2) non-sulphide (perhaps mostly quartz and siliceous) mineral carrying little of the values. The sulphide part is separately further ground (roasted if necessary), and cyanided along with the non-sulphide part. Economy is effected by avoiding unnecessary overgrinding of the usually hard, low-grade, non-sulphide part of the ore, and over-all recovery results through fine-grinding of the sulphide part. Of course, if the sulphide concentrate also contains slow-dissolving coarse gold, this may and should be removed by amalgamation or by corduroy before it is subjected to fine-grinding. If flotation is capable of making a satisfactorily economic recovery, the concentrate, of course, is not again admixed with the tailing pulp but is ground and cyanided.

In the case of a gold ore that is, or would be, ideal for cyanidation, if it were not for the presence of a harmful mineral, flotation again may be called upon to take this mineral out of the pulp or to reduce its content in the pulp to a concentration harmless to cyanidation.

To flotation must be credited the idea of concentration in the grinding-classifier circuit. This flow sheet had its first application in Michigan. A single cell sandwiched between the discharge end of the ball mill and



the classifier can and does in numerous instances effect great metallurgical savings and operating economies. Free gold is recovered, over-grinding with its attendant costs and losses is avoided, and this device aids the classifier and permits higher over-all recoveries. The success of the flotation machine in this position has led to the application of the table and the jig to this same job.

Most gold ores are amenable to cyanidation, and most yield better gold recovery by the dissolution process than by flotation. Flotation can serve in the treatment of gold ores best, in most instances, as an aid to a better and more economical recovery rather than as the principal recovery process.

There is now in process of being perfected a combination dissolution-flotation process for recovering gold from its ores. It is the Chapman process. It employs lime, cyanide, activated charcoal and flotation. The gold goes into solution presumably in accordance with the often stated equations for this reaction. The gold, however, is immediately absorbed by the activated charcoal. The charcoal with its gold content in turn, along with sulphides, is removed by flotation. Some interesting advantages are claimed for this process over standard cyanidation practice.

The fact that in most cases gold can be floated readily is not news. Recovery from placer sands, however, has been indifferent and for the most part unsuccessful. The lack of success may be ascribed to several factors; in some cases, bad engineering, in others to the absence of enough gold to make the operation pay. During the last year, a systematic study<sup>1</sup> was made of some 18 placer samples taken at scattered points over almost the entire length of the Snake River. When a fraction of pound of cyanide per ton was used, high recovery was had on all samples. All samples contained silt and mud, and, in the absence of cyanide, responded poorly to flotation. The cyanide did one or both of two things. It dispersed the slimes and presumably it chemically attacked and thus cleaned the surface of the gold. Which one or whether both of these factors were important is not known. The study is being continued.

Silver minerals<sup>2</sup> float readily, and



Banks of flotation machines concentrating molybdenite at Climax

silver ores in which the values are associated in and as sulphides yield exceptionally high recoveries. Outstanding examples<sup>3</sup> of silver-ore dressing by straight flotation are in the plants of the Sunshine Mining Company and of the Polaris Mining Company, both in the Coeur d'Alene, Idaho, silver belt district. The silver-carrying mineral is tetrahedrite. Recoveries up to 98 percent are being made.

Weathering and products of weathering strongly affect the flotability of silver ores. Waste dumps and reject dumps of previous silver milling operations seldom respond to satisfactory recovery by flotation, using standard reagents, with or without sulfidization. Further microscopic and mineralogic studies along with use of some of the newer reagents may offer the solution to this problem. The slimy, colloidal part of these ores is a possible source of the trouble.

One of the most interesting relatively recent applications of the flotation process is that of the dressing of sylvenite ore.<sup>4</sup> The ore as mined contains approximately 40 percent KC1 (sylvite), 58.5 percent NaCl (halite), and about 1.5 percent insoluble clay.

The potassium and sodium chloride crystals are distinct and separate. In some cases, the individual crystals are as much as several inches in dimensions. Generally, however, in order to unlock the respective salts, it is necessary to crush down to ordinary flotation size. The minerals of the ore

are, of course, quite soluble in water, and the novel feature of the flotation process in this instance is that it is carried out in a saturated solution of the ore itself. The reagents used are coconut oil soap with a metallic cation of the lead-bismuth type. The sodium salt rather than the potash is floated for the reason that the clay is carried up by mechanical entrainment, making it possible to produce a high-grade muriate of potash. Grinding is done in pebble mills lined with silex in order to avoid precipitation of the lead cation on fresh iron surfaces.

There is scarcely a mineral whose surface cannot be organically coated to repel water, and in turn be floated. Some mineral combinations still defy selective flotation. This is due to similarity of surface chemical properties. For example, both beryl and quartz are easily floated. Selective flotation of one in preference to the other has not been successful.

Flotation is being aided materially by classification. Often a mineral feed, containing a small percentage of obnoxious, valueless constituent, can be improved for flotation by removal or partial removal of this constituent. For this job, there is need for a classifier capable of adjustment over a wider range of hydraulic conditions than is possible in present machines.

#### Scope of Reagents Being Broadened

The scope of reagents for this job and that in flotation dressing is constantly being broadened. For sulphides, the xanthates and aerofloats still are supreme. For oxidized metallic ores

<sup>1</sup>"A Metallurgical Study of Idaho Placer Sand," Idaho Bur. Mines and Geol. Pamphlet 51.

<sup>2</sup>U. S. Bur. of Min. R. I. 3436, February, 1939.

<sup>3</sup>Holmes W. Church, Metallurgy of the Coeur d'Alene Silver Ores, Mining Congress Journal, March, 1939, p. 26.

<sup>4</sup>Potash Company of America, Carlsbad, N. Mex. Personal communication.

and other non-siliceous non-sulphide mineral, the long-chained fatty acids (oleic acid) are most generally used. A combination of xanthate and soap has proved effective on the metallic copper-bearing tailings in the Houghton, Mich., district.

Dissolved and/or emulsified in water by use of suitable wetting agents, some of the relatively insoluble long-chained fatty acids, solid at normal temperatures, and the insoluble hydrocarbon oils are being advantageously used as collectors. Emulsified collectors are particularly advantageous for flotation of minerals of near-colloidal size.

Relatively recently there has sprung up a new type collector particularly applicable to flotation of such substances as quartz, feldspars, ilmenite, chromite and other minerals whose suspensoids are negative in water. Examples of this type reagent are the heavily loaded quaternary ammonium salts and cetyl pyridinium bromide. These substances give a positively charged surface-active ion in aqueous solutions. The hydrocarbon mineral-oiling end of the molecule is in the positive ion. These substances now are generally referred to as cationic agents. Xanthates and the fatty acids have the hydrocarbon chain in the anion and are termed "anionic oilers."

Other problems to contend with are: to oil and thereby float minerals which are normally floatable, but, due to surface contamination, do not respond; and to inhibit and prevent flotation of minerals normally floatable. The nature of the surface contamination is not always definitely known. The contamination substance is either a surface tarnish as a result of surface weathering, a precipitate (colloidal hydroxide), or sediment.

Oxidation films and precipitate coatings may be removed only through use of a reagent having solvent power for the film compound. If a high concentration of reagent is required, removal of the excess reagent may be required before satisfactory flotation is possible. Adhering colloidal sediment may be removed by mechanical attrition and washing, or by use of wetting agents and/or dispersants.

Mineral depression is now effected by use of a number of classes of reagents. Those long used are cyanide, lime, potassium, dichromate, etc. A newer reagent is hexametaphosphate. This reagent in its effect on mineral flotation appears to possess dual properties. Kick, Eggleston, and Lowry<sup>1</sup>

found that when used with unsaturated soaps or fatty acids it functioned to activate a flotation of massive hematite, but had little effect or acted as a depressor with the saturated collectors. Rose and MacDonald<sup>2</sup> used this reagent in controlled concentrations as a selective depressor. The potency seems to be in its surface-active properties at solid-aqueous solution interfaces and its ability to sequester ions by forming soluble complexes with numerous multivalent cations. This reagent is a strong deflocculator of clay, and is generally a dispersant. Its remarkable properties in the water-conditioning field are well known. It has a remarkable property not only of preventing calcium carbonate scale, but of slowly removing that already present.

Other new depressants finding increasing application are the colloidal substances such as certain of the glues, resins, etc., and the non-colloidal organic compounds such as malic, gallic and tannic acid and starch.

#### New "Wetting" Agents

Although pine oil and cresylic acid still are the best known frothers, a new group of reagents known in the textile industry as "wetting" agents are receiving much attention and many applications. There are literally hundreds of these available, and numerous new ones are being developed yearly. The surface-active property of these reagents is due to the dual character of the molecule or of the large hydrocarbon ion when they ionize. They are composed of a water-repelling (hydrophobic) group such as alkyl, aryl, or alkylaryl group, etc., and a water soluble or water solubilizing (hydrophilic) group such as  $\text{SO}_4\text{H}$ ,  $\text{—SO}_2\text{H}$ ,  $\text{—PO}_4\text{H}_2$ ,  $\text{—COOH}$ ,  $\text{—OH}$ , etc.

Substances of this class are more soluble than the fatty acids, and it is essentially in this respect that they differ from the fatty acids.

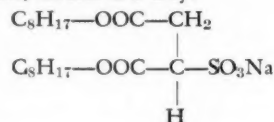
These reagents are characterized in varying degrees by high wetting power in very low concentrations; stability in acid solutions where soap cannot be used; solubility in organic solids, especially in non-polar solvents; and resistance to hard water. As frothers, many of them, unlike pine oil, are wholly unaffected by pH variations, thus permitting freedom to float at

the pH giving maximum flotation selectivity.

Some of these reagents are surface-active at the mineral water surface, and have mineral collective properties as well as frothing. Non-mineral-collecting wetting agents are serving as carrying and dispersing media of water-insoluble hydrocarbons, thus making the latter available as collectors.

In dilute solution, ionization of these agents is nearly complete. The ionization products are a large heteropolar ion, either negative or positive (usually the latter), and a small ion, positive ( $\text{Na}^+$ ) or negative ( $\text{Cl}^-$  or  $\text{SO}_4^-$ ). The large hydrocarbon bodies of these reagents when the cations are active, as already pointed out, serve as collectors of negatively charged minerals.

It was with one of these wetting agents, aerosol OT Dry.



that engineers of the American Cyanamid Company caused great embarrassment for a duck. A duck placed in a 10 percent solution of this reagent was, one might say, literally water-logged.

The wide application of the pH (hydrogren-ion) method of control of flotation pulps and of cyanide solutions should not go unmentioned. This technologic tool is a development of the research laboratory. The H and OH ionic concentrations of a pulp is a factor having profound bearing on the surface reactions involved in flotation.

The exact nature of the surface reactions that are involved at mineral-water surfaces in the numerous physical phenomena involved in flotation still is unsettled.

#### Mines Engineering Corporation Formed

Mines Engineering Corporation, a new mining company organized under the laws of Idaho, will take over further development of the property of the Silver Summit Mining Company in the Coeur d'Alene silver belt of Idaho. Prominent mining men, bankers and investors in Idaho are represented in the new organization, the board of directors including James F. McCarthy, Stanly A. Easton, Thomas R. Jones, and Robert Moffitt. The new corporation was formed following negotiations with the Silver Summit Mining Co., and it was stated that Silver Summit ground will be explored fully at depth.

<sup>1</sup> Amer. Inst. of Min. and Met. Engrs., Tech. Pub. 768, Jan., 1937.

<sup>2</sup> Min. and Met. 18, 285-286, 1937.

# The Adaptation of CUTTING BITS to Mining Conditions

THE advantages of mechanically undercutting a coal face were recognized in England as early as 1761, at which time a patent was granted for a mechanical coal pick. The history of American manufacture dates from 1877, with the introduction of the pneumatic coal-pick and later the breast machine. These two types predominated in American mines for more than 30 years. By 1910 the shortwall undercutter had come into use to be followed a few years later by the track-mounted machine, and by 1920 these newer designs had replaced, for the most part, the earlier mechanical picks and cutters.

The importance today of mechanical cutting in our bituminous mining operations is obvious when we consider that about 12,000 machines are used in cutting 85 percent of our bituminous coal production. For 1937 it is estimated that 350,000,000 tons were so mined.

Constant improvements have been made in drive mechanisms, with increased efficiencies and lessened maintenance. During the early development period of this class of equipment, but little consideration was given to the improvement of cutter-bars, chains or bits. It has been proven that a study of face conditions and the selection or build of proper cutting tools have resulted in marked economies in machine maintenance, bit cost and power cost, as well as faster cutting speeds and a better grade of slack.

## Accurate Measurement Important

Known facts are the basis of design and proof of progress in design. Since measurement is a means of determining facts, measuring instruments are very important tools to research and accurate test.

Figure 1 shows a graphic watt meter used for mine test work. With it a graphic record is obtained—one that is more accurate than can be obtained by recording readings of non-

## Recent Improvements in Bit Practice and Operation Outlined, and Advantages Evaluated

recording instruments. Such a record is permanent and not subject to any prejudiced human element. By means of a coordinated time study, the graphic chart can later be marked to indicate various steps in the cutting process, as, "entering place," "sumping," "cutting," etc. A volt meter and ammeter are mounted on the top of the instrument, but do not give a graphic record. However, volts and amps read at regular intervals serve for an intelligent comparison of such items as cutting speed. Of necessity, some tests are made by day and some by night. At most mines the voltage on the off-shift is higher and more uniform than on the loading-shift. Hence a wattmeter record only is not entirely satisfactory.

## Economies in Proper Design of Cutting Bits

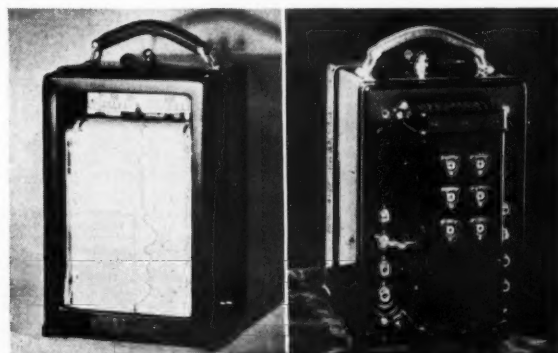
When a reduction in power to a coal-cutting machine is attained through the proper design of the cutting-end, direct and indirect economies are effected. The direct economy is the elimination of power waste. The indirect economies are reduced maintenance of chain and machine mechanism, a lower bit cost and increased cutting speed.



By JOHN W. BUCH  
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The first cutter bits used on breast machines were made from  $\frac{3}{8}$ -in. x  $\frac{1}{2}$ -in. stock and later from  $\frac{3}{4}$ -in. x  $\frac{1}{2}$ -in. stock, sharpened to a chisel or modified chisel point. When chains built with more positions for short-wall machines came into use the value of the pick-point was realized. For several years hand-sharpening preceded development of various types of

Fig. 1.  
Recording watt  
meters furnish  
valuable records in  
studying machine  
operating  
efficiency





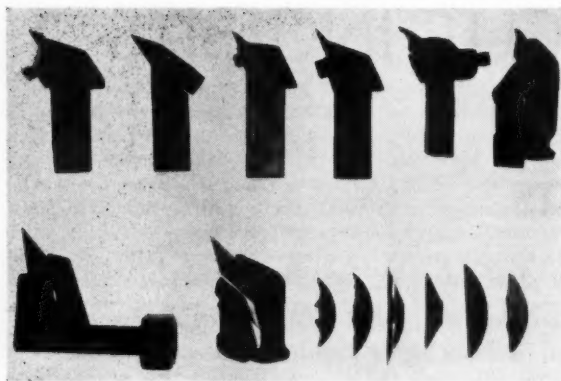


Fig. 2.  
Stages in evolution  
of multiple pointed  
bit over a 15-year  
development  
period

mechanical hammers, and then passed on to the roller type, which is still in general use. Most conventional bits are repointed without definite heat control, for only at very large mines is the volume sufficient to justify expensive furnace equipment. Thus chains are often used with bits of all degrees of cutting efficiency, the final result of each set of bits being measured by the performance of the poorest.

There seemed to be several advantages here for factory-made, multiple-point, throw-away bits. Among them were: (1) material suited to particular need; (2) factory heat-treating, with large volume justifying the necessary equipment for so doing; (3) bits automatically set to gauge; (4) proper cutting angle for mining conditions; (5) uniform clearance; (6) uniform cutting edge, and (7) just one problem less for the operator, which he would accept if the performance and costs justified.

To review briefly the foregoing, it is generally conceded that a cutter-bit should be able to withstand heat, abrasion and shock. This is a difficult assignment. The metal in general use for multiple bits has the following physical properties: (1) high abrasive resistance; (2) high hardness; (3) high impact resistance, and (4) a close grain density. It is rolled into rhomboidal shaped bars, from which the bits are sawed, then heat-treated. These bits can be manufactured for a cost of about 3 cents each, or, 1½ cents per point. The cost for repointing conventional bits is of course variable—depending upon the wear to which they have been subjected, the quality of the resharpened bit and whatever loss might be incurred in transportation, and will vary between ¾ cent and 1½ cents per point.

Factory-made alloy steel bits will give from three to seven times more service with a corresponding reduction in power, time and machine maintenance cost than will shop repointed bits. In view of their shape and ample clearance, multiple bits can be worn to a much duller condition without greatly increasing the power consumption.

Figure 2 shows the evolution, so to speak, of the multiple pointed bit, and represents a 15-year period of development. As you will note, at first an attempt was made to design a bit, fitted to a shank, which in turn could be used in the conventional chain. This was discontinued, because of the difficulty in holding all parts together, and a chain was designed for use with multiple bits.

In addition to the multiple bits, there has recently been much activity in perfecting a process whereby a very hard material, as tungsten carbide,

borium carbide, etc., is applied to the wearing surface of the conventional bit point. With the process as it now stands, the hardening material is applied from a rod form, using an acetylene torch, to a blunt pointed conventional style bit of carbon steel. The difficulty for more than 10 years has been the application of the material without damaging the bit stock. Reported costs for tipping only are as low as 8/10 cents per point though the average total cost is probably about 2 cents per point.

### Position and Lacings of Chains

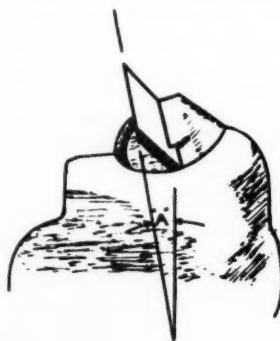
In recent years elaborate and extensive tests with various position and lacing of chains have been made, involving the expenditure of considerable amounts of money, for the purpose of determining power input, time cost, bit efficiency, and sizes to be found in the kerf.

Many data are available, but it is a subject difficult to generalize because of the many cutting conditions met in mining. In soft coal with loose grain there is little to be gained through chain design. In hard, free-cutting, snappy coal, a 5-position chain on a machine with a fast feed will produce very coarse cuttings. In a coal of a tough woody nature, a close-position chain is the only type that will give satisfactory results. When sulfurous concretions and bands of various sizes and thicknesses are present, no bit steel can withstand much usage. All these and other local conditions call for bit lead, position, lacing, size, shape and temper of bit best suited for the work at hand.

Figure 3 shows three bit leads which have been proven by testing to be correct. For long-face work a bit angle of not less than 22 degrees will hold the machine to the face, although this can often be aided by adding two or more center bits to the chain, or by substituting double bit lugs for single bit lugs in an equal amount of extremes. On shortwalls and track-cutters, in what can be termed "ordinary cutting," a 13 degree angle is used. In hard cutting—streaks of bone, etc.—a 7 degree angle is used.

Figure 4 shows a number of chain lacings, explained as follows.

Diagram A shows the 11 position 6 and 7 way. Some manufacturers have assumed that because the extreme bits cut the corners, more are needed. A 9 position 5 and 6 way is another example of this type of lacing. Extensive tests, however, have proven



| Nature of Work                                  | Angle A° |
|---|----------|
| Longwall  | 22°      |
| Shortwall or Airstall<br>Ordinary Cutting       | 13°      |
| Shortwall or Airstall<br>Extremely Hard Cutting | 7°       |

Fig. 3. Bit angles for different  
cutting conditions



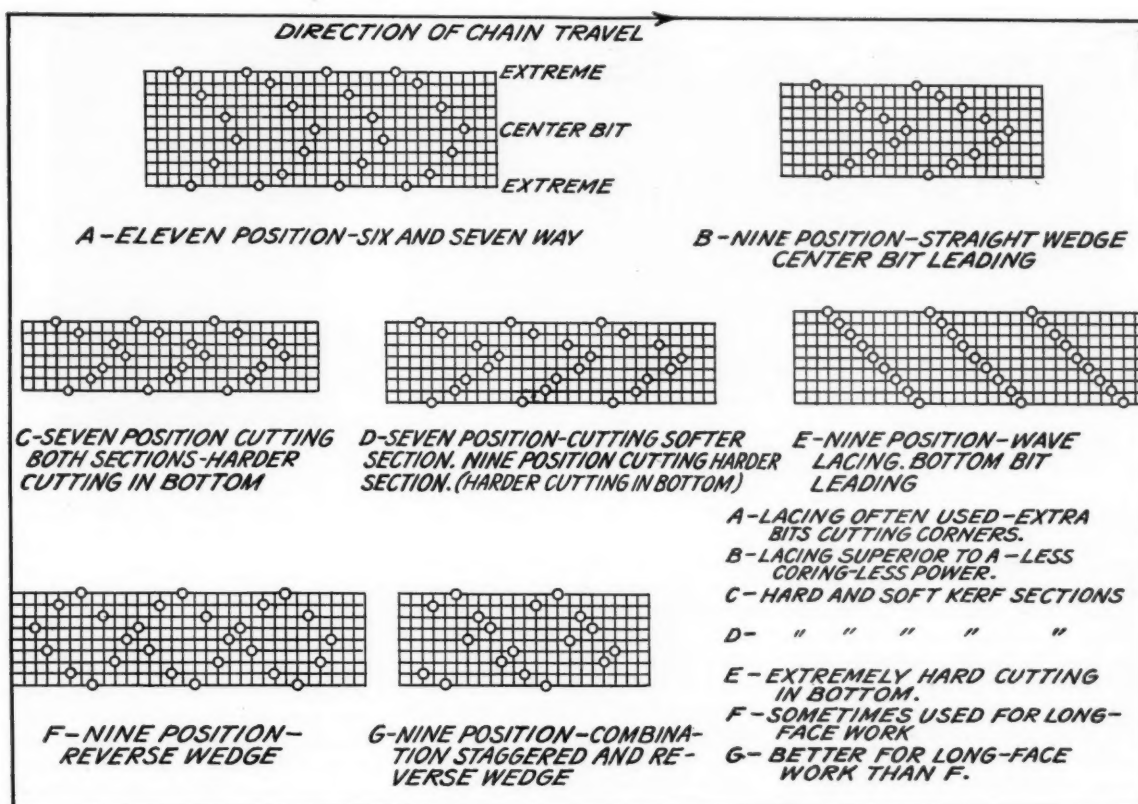


Fig. 4. Diagrams showing various types of chain lacing

that a 9 position chain, straight wedge, center bit leading, consumes less power, cores less, and requires less bits (See B).

In mines where a reasonably uniform stratum of hard touch material must be cut with either half of the chain, the usual procedure is to build a 7 position chain and lace approximately one-third more lugs in the half cutting the harder material (See C). Often, too, this condition is handled by using regular lacing and

9 position spacing in the harder stratum and 7 in the other half (See D). In cases where the bottom was extremely hard to cut and bottom bits were dulled, causing the bar to climb, a 9 position chain, built 9 way, wave lacing, bottom bit leading was used (See E).

A reverse wedge (See F) is sometimes used, but it has been found that a combination reverse wedge and staggered wave lacing consumes 15 percent to 20 percent less power for

cutting two ways (See G). When hard laminations occur in the section of the bed to be cut, a serious coring condition is often set up, because the softer coal above and below these hard streaks allows the bits to deflect and follow the bit in the next position up and down. This core is often intact until the bit blocks wear or break it down and the use of core-breaker blocks, alleviate such a condition and have proven to result in less power consumption.

### Lake Superior Iron Ore Movement Closes As Preparations for 1940 Season Begin

Coincidental with the close of navigation on the upper Lakes late in November, with heavy shipment during the last three months boosting the total tonnage of iron ore shipped from the district to over 45,000,000 tons, was brisk activity at both underground and open-pit operations preparatory for a busy season in 1940. Production at the underground mines of the district will continue actively this winter, rebuilding badly depleted stockpiles, and stripping programs

are under way at the many open pits.

The Oliver Iron Mining Company will carry on underground mining this winter at the Godfrey, Morris, Spruce, Leonidas, Soudan, Pioneer, Sibley, Puritan, Davis Geneva, and the Holmes-Section 16, in addition to carrying out its usual mine stripping campaign in the Canisteo district, Hibbing-Chisholm district and Virginia-Eveleth district.

Underground mines of Pickands, Mather & Company which will be active during the winter are the Zenith, Newport, Anvil-Palms, Sunday Lake, James, Buck, Bengal, and East and West Vulcan. In addition to stripping at many open pits, the company is

removing tracks and constructing roads at the Albany, Biwabik, and Corsica open pits on the Mesabi range preparatory to installation of truck haulage next season.

The M. A. Hanna Company is maintaining production through the winter from its Homer, Hiawatha No. 1 and 2, Bates, and Wakefield underground mines, and is carrying out a stripping program at the Mesabi Chief mine on the Mesabi.

International Harvester Company is operating its Agnew iron mine at Hibbing on a double shift, five days per week, in order to replace its greatly depleted stockpile.

# Domestic Sources of Deficient Minerals

- ***Geologic Factors Controlling Their Origin Exceedingly Diverse. Present Program Will Clear Up Uncertainties on Reserves***



By **D. F. HEWETT**  
Chief, Metalliferous Deposits  
U. S. Geological Survey

**Y**OU have doubtless heard the statement made that no equivalent area in the whole world contains the diversity, quantity and richness of metals as does the area included within the United States. I subscribe to that statement. Considered with the supplementary resources of nonmetals and fuels, as well as those of soil, forests, water, climate and configuration of the land, these resources constitute such a basis as does not exist elsewhere in the world for a balanced industry that permits and will continue to permit, for many years, the highest standard of living for so large a population.

This concept of abundance of the metals has arisen rather recently, for until about 1850 we were largely an agricultural people. The abundance of timber and of anthracite coal permitted the early development along the Atlantic Seaboard of a modest iron industry which moved westward with the development of coking coal and iron ore in the Ohio valley. Then followed the copper and iron of Michigan, the lead and zinc of the Mississippi valley, and, gradually, the gold, silver and copper of the west coast and the Rocky Mountains. The idea of abundance spread widely with the extraordinary production of iron and copper in the Lake Superior region and of gold, silver, copper, lead and zinc in the western states from 1890 to 1915. During this epoch, few were impressed by the deficiencies of such metals as tin, nickel, manganese and chromium in our national economy.

In my opinion, the war from 1914 to 1918 not only revealed these deficiencies clearly, but the efforts to

secure these metals gave the first aspects of a clear picture of the nature and the limitations of our supplies. A nation accustomed to abundance in many things does not readily concede or adapt itself to the idea of scarcity in some things, and those who warn of impending problems are never popular.

Few realize that in the history of our production of the metals, we are conforming rather closely to a cycle that has been experienced by many other countries. De Launay, the French geologist, first noted that in most countries there is a tendency for the production of gold to attain its zenith first, and that it is succeeded by peaks in production of silver, copper, lead, zinc and iron.

How shall we approach the problem of the reserves of strategic metals in the United States so as to obtain the necessary data and convey a clear idea to many classes of persons, professional as well as lay, just how much of each may be produced from time to time, at what price, and for how long? We all know that minerals are a wasting asset and that advances in technology make material of progressively lower grade available at the same or lower prices. Many persons assume, therefore, that this tendency continues indefinitely and that we shall never face shortage or scarcity. A careful review of Europe during the 19th century, as well as our own Atlantic seaboard, will dispel this illusion.

The basic data for any appraisal of our resources of the metals are threefold: Geologic, technical and eco-

nomic. The geologic data include all of those elements of mineral content which determine grade and recovery; those elements of environmental control, such as the enclosing rocks, sedimentary and igneous, which determine distribution; and those structural features, which determine form and persistence of ore bodies; and finally, in rare cases, even physiographic history which sometimes limits distribution and depth. The technical data include all of the elements of mining methods, which affect recoverability from the ground, and of milling and metallurgical processes, which determine recovery from the mined ore. The economic data include all of the elements that affect price, such as accessibility, markets, and competitive position, since many metals compete with each other and with nonmetals.

What are the geologic problems and what are the needed data in a national program of study of the deficient metals—tin, nickel, manganese, chromium, tungsten, mercury, antimony and aluminum? As I see it, they are the problems inherent, first in the chemistry and mineralogy of those elements which affect their regional distribution and their persistence in depth, both primary or hypogene, and secondary or supergene. Secondly, there are those structural features, such as the attitude or form of the stratified rocks, or of the foliation of metamorphic rocks and the fractures in all varieties of rocks, generally unique in each district, which determine the shape, attitude, and persistence laterally and in depth, of the minable bodies.

## Strategic Metals Have Very Diverse Geologic Origin

Among the 21 metals which are regarded by the Army and Navy Munitions Board as essential, critical and strategic, it would be hard to select eight that present more geologic problems than those that are included in the group classified as "strategic." Without burdening you with a long discussion on the subject of the origin of ore deposits, I should say that the important accumulations of these metals clearly have been formed in many ways. In some, the metals were present in solutions which have risen from deep sources and have been deposited in simple veins or replaced diverse varieties of rock; some represent supergene enrichments below the surface, generally near water-level; others have accumulated on the surface of the land under conditions of prolonged weathering, such as arise during peneplanation; others have been laid down as sediments in marine basins, and, finally, some are placer deposits in stream channels.

To me, a geologist, an adequate picture of the extent, shape and grade of an ore deposit, as well as the most efficient method of exploiting it, should be based upon a thoroughly sound concept of its mode of origin. I recognize that many good mines have been developed "without benefit of the geologic clergy," and I realize that the science of economic geology has developed rather recently and slowly. I believe, however, that no picture of our reserves of ore can be sound without good geology.

I shall try to summarize briefly some of these problems for each of the eight strategic metals.

### Tin Includes Placer and Lode

Tin should be considered first because we consume half the world's supply and yet we produce far less than 1 percent of our needs. The oxide, cassiterite, is not only heavy but it resists decay near the surface; consequently, it accumulates readily in placer deposits. Curiously, like gold, it is first recognized in and recovered from placers, but, unlike gold, in only a few of the important districts have workable lodes been found nearby—notably Cornwall, the Erzgebirge and Bolivia. During recent years about 65 percent of the world's production has come from placer deposits in districts that have yet revealed few workable lodes. This is true of Alaska



Cajalco tin mine in the Temescal district, Riverside County, Calif. Lower dump from old shaft operated in 1890-92. Upper dump from new shaft operated 1927-29

thus far, as well as of the East Indies. Important placers appear to arise out of exceptional processes of erosion. Therefore, in viewing the 10 districts in the United States in which tin is found in appreciable quantities, the evidences of erosional history that bear upon the accumulation of placers, such as the development of mature river systems and of peneplains which permit the accumulation of cassiterite in any channels should be carefully considered. Noteworthy cassiterite-bearing veins have been found in about 10 districts in the United States, but it has not yet been proven that any are rich enough or extensive enough to be worked at a profit at present prices. As studied thus far, the principal mineral is cassiterite, but the associated minerals are diverse and it seems that about five types of mineral assemblages can be recognized. It is hoped that by close study and careful sampling of these deposits some idea of their persistence in depth as well as horizontally, and of their grade, can be gained.

### Nickel in Basic Rocks

Next to tin comes nickel of which we consume 40 percent of the world's supply, but produce only one-half of 1 percent of our consumption. Even though small quantities of several nickel minerals are found in many places in the United States, the outstanding concentrations of nickel appear to be those silicates that result from supergene enrichment of small quantities, less than 0.25 percent, present in such basic rocks as serpentine and its antecedents, peridotite and norite. Actually, we produce no nickel from these sources, and that which we do produce represents metal recovered in the refining of other metals, such as copper. The first step in studying our outstanding sources seems to be

the determination of the areal extent, depth and grade of the enriched superficial zone, and these may be related to the local physiographic history. At a few places, such as Lancaster Gap, Pa., and Key West, Nev., lenses of sulphides containing several percent of nickel appear to be related to deep circulations in the nickel-bearing basic intrusives. The known deposits of this type are relatively small.

### Data on Manganese Very Complete

Among the eight strategic metals, I would say that the geological survey possesses more information about our resources and the geologic problems of manganese, than any other. As the result of a campaign of intensive study of outstanding districts during the war, and a continuing but less intensive study since then, we have the record of appraisals by competent geologists and engineers, within and without government employ, of about 1,500 mines and deposits. In addition, there are further records, mostly poor, of nearly 500 more occurrences of manganese minerals that probably should be examined. This record contains a wealth of information about the manganese minerals, their distribution, relations, and geologic environment, as well as the shape, sizes, grade and persistence of deposits.

It is my confident belief that among the common metals, manganese deposits present a greater diversity of features and of geologic problems than any other. The superficial portions of its deposits are commonly extremely puzzling and deceptive. Among the dozen common oxides which are most desired by the industries because they contain more than 50 percent metal, only a few persist below water-level, which is commonly one to 200 feet feet below the surface in the East, and 300 to 600 feet in the West. I



Three Kids manganese mine near Las Vegas, Nev. Workings explore bed of manganese oxides 20 to 30 ft. thick running 30 percent manganese



know at least a dozen mining and milling plants, each of which cost between \$300,000 and \$1,000,000, which were built on the assumption that the oxide ore bodies near the surface were widespread and persisted downward, and which were scrapped and abandoned when a little deep exploration showed that they were not.

In 1918, when prices were five times normal, high-grade ore from domestic mines yielded 19.3 percent of the metal needed as ferromanganese by the steel industry, and low-grade ore, 15.9 percent of that needed as spiegeleisen, or a total of 35.3 percent of our needs in both alloys. As the result of explorations and studies since 1918, noteworthy reserves of low-grade and manganiferous iron ore have been developed, but there has been little change in the outlook for high grade ore. There is cause for some optimism that improved mining, milling and metallurgic technique may permit the recovery of noteworthy quantities of manganese oxide or metal to supply our needs, but at costs well above present prices.

#### Geophysics Help in Chromite Exploration

Numerous deposits of chromite, like manganese, are known in the United States, principally in California and Oregon, and the war-time prices, three times normal, brought out 45 percent of our needs at that time. In an attempt to appraise our resources of chromite, we are fortunate in that all of the concentrations are found in rocks that show a narrow range in composition. These are the ultrabasic rocks, high in magnesia, that are called peridotite, norite, etc., which, in most places, are altered to serpentine.

In most regions, the first step in appraising the resource is the accurate mapping of the areal distribu-



Chapin ground in Artillery Peak district, Mojave County, Ariz. 57 ft. of sandstone contains about 6 percent manganese

tion of such rocks, where they are known to contain bodies of chromite, and geologic parties are now doing this in three areas in California, Oregon and Wyoming. In other parts of the world, single bodies of chromite have yielded as much as several hundred thousand tons of ore, but of the thousand deposits recorded in the United States during the World War, the largest production from a single deposit is about 16,000 tons, and several hundred other deposits have been regarded as exhausted after yielding a few hundred tons or less. Some of the largest known domestic bodies are tabular or lenticular, and it is hoped that careful study may reveal some of the elements that control form and perhaps size.

It is fortunate that magnetic surveys of chrome-bearing areas can yield significant information concerning their size and shape in advance of exploration. The results of one experimental study on Casper Mountain, Wyo., hold out hope that, where applied to small areas, magnetic surveys may accurately reveal a buried deposit.

#### Tungsten from Disseminated Scheelite

For many years, prior to the war period, all of our domestic tungsten was recovered from simple vein deposits in a few districts, some of which yielded wolframite and some scheelite, relatively unmixed with other metallic minerals. The war-time campaign of search revealed many deposits of a different type, and these are now the main source of our supply. I refer to the tabular bodies of highly altered limestone which contain disseminated scheelite, rarely more than 1 percent,

but readily recoverable by flotation. There is reason for believing that precise areal mapping of the favored limestone beds in regions known to contain scheelite-bearing bodies may greatly extend the favorable areas. Detailed mapping of the districts that contain wolframite—or scheelite-bearing veins may reveal some that are not known, but I suspect that only exploration by trenches and diamond drilling will lead to actual discovery.

#### Mercury Found in Recent Times Geologically

More mines have produced mercury in the United States than in any other country, and the New Almaden mine, in California, was one of the great mercury mines of the world. A review of our record of production seems to indicate that we have passed the zenith, at present prices. Even though our mercury deposits occur in several kinds of rocks of diverse ages, accumulating evidence indicates that most of them formed in recent time, Tertiary or later, and that their distribution coincides roughly with that of existing hot springs. Most exploited bodies are tabular and several

persist a thousand or even 2,500 feet below the surface, but many have been exhausted at shallower depths. There are real problems in exploring mercury deposits far in advance of actual mining, and I believe we geologists can make our best contribution by careful study and mapping of some productive areas in the hope that such a study will reveal the environment under which the veins are found.

### Antimony and Bauxite

In recent years, domestic mines have yielded 10 to 15 percent of our needs of antimony metal; the maximum was 30 percent in 1915. Most of this has come from about a dozen mines in Idaho, Nevada and California. As prevailing prices of the metal have been low, and the only market for ore is a single smelter, there has been little incentive to operate mines. The program of work on antimony includes detailed study of the productive districts in the hope that it will throw

The foregoing resume of some of the geologic relations of the deposits of the eight strategic metals indicates something of the program of work that will be carried out by the Geological Survey in its attempt to reveal more accurately the nation's reserves. We shall make some effort to examine numerous recorded and reported deposits of these metals that are not yet adequately examined, but we shall lay emphasis on careful, detailed studies of those districts for which existing dependable information indicates a definitely hopeful source of one of them.

### Present Program Will Clear Up Uncertainties on Reserves

In carrying out its many kinds of studies during its 60 years of activity, the Geological Survey has generally had to be content to examine and record, in various degrees of detail, the natural exposures of rocks, veins, etc., and the evidence from such artificial openings as mines, drill

will be necessary, both in planning and in the actual exploratory processes. After much discussion about our cooperative activities, it has been decided that the Survey will do most of the reconnaissance examination work, and then carry out detailed district studies that will serve to guide the programs of exploration by the Bureau. Final interpretations of the reserve situation will be based on joint review of the evidence obtained. I feel sure that the program of work that we are planning will clear up many uncertainties concerning our reserves in the strategic minerals.

### Legislative Program of A.S.M.O.A.

The legislative program adopted by the Arizona Small Mine Operators Association at their recent Tucson meeting includes the following:

1. A mining code providing for a simple method of conducting mining operations on state lands and provision, if possible, for the securing of title or patent or long-time leases that would encourage investment.
2. Legislation looking toward revision, simplification and reduction in cost of present procedure in filing assessment work affidavits.
3. Simplification of U. S. Statutes relating to the issuance of patents and reducing the red tape and cost of same.
4. Establishment and maintenance of a disabled miners' hospital from the revenues or sale of U. S. land donated to the state for that purpose.
5. Legislation which would exempt mining property from the real estate code insofar as requiring sales to be made only by real estate brokers.
6. Legislation which would permit of prompt eviction of a person taking a bond and lease and failing to live up to the terms of the contract.
7. Law that would make it a felony to steal or destroy mining equipment and would require written evidence of ownership.
8. Revision of state water code, clarification of ownership and preservation of water rights for mining purposes.

State Secretary Charles F. Willis recently urged thorough discussion of these proposals at various council meetings throughout the state, and indicated that committees would soon be appointed to analyze and report on each of the planks in the program.

During November the various councils making up this active organization were instrumental in organizing 100 mass meetings throughout Arizona with an estimated total attendance of from 30,000 to 35,000, as a protest against any reduction in the excise tax on imported copper such as was contemplated in the pending Chilean Trade Agreement.



East cut on gold-bearing antimony ore, Stibnite, Valley County, Idaho

light on the extent and distribution of the deposits.

As with mercury, a review of the record of domestic production of bauxite, taken into consideration with our present knowledge of the deposits, indicates that we have passed the zenith of production of this ore of aluminum, although a recent review indicates that large reserves of low-grade ore are known to exist. As the result of a project undertaken by the Survey in Arkansas several years ago, it appears that a campaign of exploration by drilling will be necessary to greatly increase our knowledge of reserves.

holes, etc., made by private groups, and to draw from this evidence conclusions concerning areal extent and persistence in depth. Only rarely, notably in the explorations for potash salts in Texas and New Mexico, has it been possible to carry out a campaign of exploration to prove the existence in depth of a mineral deposit whose presence was inferred from studies on the surface. As you know, this program of exploration, carried out by the Bureau of Mines and Geological Survey, was highly successful.

Obviously, to accomplish the objectives of the present program, close cooperation of geologists of the Survey with the engineers of the Bureau

# Factors Influencing BLASTING\*

VISITING coal mining operations of all sorts and classes around the country gives one opportunity to notice how similar problems are solved in different places by different people.

Naturally, many of these practices are good for only one set of conditions. But many are applicable, with minor adaptations, to most situations.

Basically, in the more progressive coal mines, safety and efficiency are considered inseparable. The newest equipment is recognized as the most efficient, and the safest. Keeping it in first-class condition is known to be profitable and safer. The safest methods of work are considered the best, for safety has proved to be sound business practice, which pays its way in good-will and reduced overhead.

Supervision is the keystone, for the best laid plans go wrong when the executive will to safety and efficiency gets lost at the face.

## Factors Influencing Blasting

Choosing "the right explosive for the job" is a complicated and exacting task. It requires a detailed knowledge of the operation and its special characteristics. It requires a thorough "know-how" of explosives' action.

However, even after the explosive grade has been selected, the work an explosive does is influenced by some or all of the following factors:

- 1—Diameter of cartridge.
- 2—Loading procedure.
- 3—Drill hole diameter.
- 4—Stemming and tamping.
- 5—Cutting methods.
- 6—Bug dusting.
- 7—Cushioning or "Space Shooting."
- 8—Method of priming.

## Diameter of Cartridge

The use of cartridges of larger diameter than the basic 1¼ in. x 8 in. size has certain advantages. The charge may be concentrated at the back of the bore hole. This means that a smaller area of coal is in direct contact with the explosive, and fines are reduced. In addition, larger diameter cartridges generally stand up better under long storage. Also, sen-

## ● Simple Fundamentals Such as Proper Cutting, Placement of Holes, Stemming, Bug Dust Removal Important in Determining Work of Explosives

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Atlas Powder Company

sitivity is better in large sizes of any given grade than in the small sizes.

However, there is one very important, and perhaps not too well-known characteristic of explosives which must be considered when the merits of a grade of explosive are being discussed. The velocity of all explosives tested to date increases when cartridge diameter is increased. Velocity also increases under confinement. The rate of velocity increase depends upon the grade, and all grades do not show the same rate of increase.

Naturally, this characteristic is important in selecting the right explosive. It is equally important when considering performance.

## Loading Procedure

It is not uncommon to find a shotfirer in one section of a mine slitting the cartridges and tamping them firmly in the bore hole, while in another section of the same mine cartridges are loaded intact and simply pushed into the back of the hole.

The first man, in effect, is increasing the diameter of the cartridge to that of the bore hole as he tamps it back with his tamping stick.

Remembering that velocity increases and confinement and diameter increase, one would naturally expect different results from these two different procedures. As a matter of fact, the coal often will look as if brought down by two different grades of explosive.

## Drill Hole Diameter

Another factor that can make an explosive act like a different grade is variation in the drill hole diameter. In some cases variations are as much

as ½ inch to 1 inch from one section of a mine to another.

If the depth of a drill hole is kept constant the volume varies as the square of the diameter. In other words, a drill hole having a diameter of 1½ inches would have a cross sectional area of 2.25 square inches, but a 2-inch hole has a cross sectional area of 4 square inches—that ½-inch difference in diameter almost doubles the volume of the second drill hole over the first.

Of course, this materially affects confinement. A cartridge which is a tight fit and is well confined in the smaller hole has a good bit of air space between it and the coal in the larger hole, and the effect of the blast is cushioned. The lesser confinement of the larger hole would also tend to keep the velocity of the explosive below what it would be in the smaller hole.

## Stemming and Tamping

Different types of stemming and different degrees of tamping result in varying amounts of confinement, which affect the action of the explosive.

Tamping bags that are too long and much smaller than the bore hole telescope or collapse when tamped so that only the first four or five inches are compacted and the remaining length is practically unaffected by the tamping stick. Such conditions may cause unintentional cushioning which would cause variation in velocity and possibly provide inadequate confinement. Proper diameter, shorter length tamping bags would remedy the situation, and would give the explosive a chance to work in a normal manner.

A British Bureau of Mines publication\* lists the effectiveness of stem-

\* Presented to Illinois Mining Institute, Springfield, Ill., Nov. 10, 1939.

\* "Stemming Materials" Paper No. 84.



ming materials in this order: sand, as the most effective, stone dust, second; clay, third, and water last. For practical purposes the British Bureau of Mines recommends the use of a mixture of three parts sand and one part clay. This has proved very effective.

The preparation and the use of proper stemming, in some localities, is something of a lost art, and it would not be amiss perhaps to review some of the main reasons for its very great importance, from both the efficiency and safety angles.

Stemming provides positive confinement, which means:

1. It prevents blown out shots and resultant projection of flame and hot gases into the surrounding atmosphere.
2. The amount of fumes is kept to a minimum.
3. It decreases the amount of explosive needed to do the work.
4. It keeps the amount of fine dust thrown into the air at a minimum.

It might be interesting in this connection to note that in Belgium they require the stemming to weigh five times as much as the explosive. In France the requirement is that at least eight inches of stemming be used for the first 3.6 ounces of explosive and 2 inches for each additional 1.8 ounces.

Tamping should be done in a uniform manner. The general practice is to tamp the first dummy lightly, and the remaining dummies firmly into place.

#### Experiences of a Coal Land-Holding Company

Officials of a coal land-holding company found their royalties were in direct proportion to the quality of the coal produced by the coal companies operating on their land. As quality went down, so did their profits. Accordingly, they set out to find just what most affected the returns. Their investigation showed that the following factors definitely increased their percentage of lump coal:

- 1—Correct cutting.
- 2—Removal of all bug dust.
- 3—Proper placement and diameter of drill holes.
- 4—Cushioned blasting.

Incidentally, they had tested a great many grades of explosive and contrary to general opinion felt, the grade used was of minor importance.

#### Cutting Methods

It is empirical knowledge that qual-

ity coal is produced only when the coal is properly cut. When the land-holding company representatives raised the question in the different coal company mine offices, they were assured that all places were cut according to instructions. However, when they went into the actual working places they found the percentage of improper cuts quite high. They attributed this to inadequate supervision of poorly trained machine runners. Some of the cuts were found to be pear shaped; others were cut like trapezoids, parallelograms and all sorts of geometrical figures. It is almost impossible to locate the drill holes correctly in an irregularly cut place and produce a maximum amount of lump coal.

#### Bug Dusting

The investigation also revealed that very few places were thoroughly cleaned. A cut partly filled with bug dust is apt to prevent the coal from breaking down properly and allow for adequate roll. This usually requires hand mining to free the coal and means coal degradation. Moreover, ash content is likely to be higher in uncleaned cuts.

For these reasons they recommended that all working places in their mines be supplied with a long-handled shovel and special brush so that all cuts could be thoroughly cleaned.

#### Placement of Drill Holes

The location, depth and direction of drill holes frequently has to be modified to meet changing conditions. It is a problem that requires constant attention because of such variables as the coal seam, roof structure and method of loading. Here again, proper supervision is essential for profitable results.

#### Cushioning

Cushioning reduces shattering and is a direct means of more or less "pulling the punch" of the explosive.

Several methods are in use: One way is to use a cartridge of much smaller diameter than the drill hole, and another is to use some mechanical means of supporting the cartridge so that it is not in contact with the coal.

Several explosive companies have been doing considerable work with sheathed permissibles. The sheathing is inert material that adds greatly to the safety of fixed explosives. It cuts down both temperature and flame. This light bulky sleeve also provides

a certain amount of cushioning. Naturally this is helpful in producing quality coal. In European countries sheathed explosives have been widely accepted primarily because of their additional safety.

#### Method of Priming

The direction detonator is pointed is important from a safety standpoint. There are two general ways of priming, and the argument is not settled yet as to which is the better.

**Indirect Priming**—With this method the cap is placed in the first cartridge at the back of the bore hole pointing towards the face. When shot, there is a "directional projection of the products of explosion toward the face." In instances where sufficient stemming is not used, hot gases and flame may be expelled into the room. Such a condition might result in a mine explosion.

**Direct Priming**—The exploder is in the last cartridge to enter the bore hole, pointing towards the charge. Here the explosive wave and gases travel toward the back of the cut; they act like a gaseous stemming and reduce the gun barrel action of the bore hole.

From the standpoint of execution both methods have ardent defenders. Only tests and results can prove which practice is the best. It is a well established fact that the end of the detonator should always be pointed towards the charge since the cap end has a bullet like action which helps to prevent misfires.

Naturally, all these points can be expanded. Coal blasting is really not the simple operation it might seem at first glance. Much study has been given to it by explosive companies. Their representatives have had varied and wide experience. Both parties would profit by close cooperation and by the provision of adequate supervision to see that the joint plans decided upon are carried out carefully at the face.

#### Mine Inspectors Survey Bootleg Operations

It was recently reported by Mine Inspector James Quigley, of Mt. Carmel, Pa., that the nine mine inspectors in the Pennsylvania anthracite field between Lansford and Trevorton are now engaged in a thorough survey of the bootleg industry. The State Department of Mines and Mining at Harrisburg has authorized the survey in order that reliable statistics on the industry might be assembled.

# Social Security Act Charted

## ● Useful Chart of Principal Features of the Social Security Act as Amended in 1939 Covering Both the Federal and State of California Requirements

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Mine Tax Accountant  
With Mr. Harvey S. Mudd  
Los Angeles, Calif.



THE following chart, touching only briefly upon the principal features of the federal and state of California Social Security Acts, is offered to those who may have a need similar to that which prompted preparation of the chart,—the need for a ready reference in answering various questions of the management as well as employees. Copies of the chart have been made and furnished to the accounting departments of our affiliated companies as a guide in accounting for and reporting under provisions of the Acts.

The chart embodies the provisions of the Federal Act, as amended in 1939, covering both the old age benefits and unemployment compensation insurance; also, it includes the principal provisions of the California Unemployment Reserves Act, as amended in 1939.

Many states already have adopted corresponding unemployment insurance laws, and no doubt all states will eventually have uniform provisions. An employer under the laws of a state other than California can readily substitute on the chart any different provisions of the law of his respective state, thus making full use of the chart.

Penalties for failure to comply with the requirements of the Acts have not been listed on the chart since they can be easily located (by the few who may be

subjected thereto) in the index to the Act under consideration.

No attempt is made on the chart to define such terms as "employer," "employee," "wages," etc. Reference therefore should be made to the definitions under the Acts. Brief comments and explanations are attached to the chart to call special attention to certain new provisions, due to the 1939 amendments, which offer an advantage to employer or to employee (see notes Nos. 2 and 3).

The accounting department of each employer should give special attention to computations of the employer's "Contribution Reserve" account with his state in order to secure the full benefit of reduction in employer's tax rate, due to merit rating (available in California after January 1, 1941). Upon request, state departments will furnish employers with a statement of their reserve accounts showing total contributions and detail of benefit payments charged to each employer's reserve account.

See notation on chart as an example of possible decrease in an employer's tax rate due to merit rating under the California law.

### CHART OF PRINCIPAL FEATURES OF THE SOCIAL SECURITY ACT AS AMENDED—1939 For Both Federal and State of California Requirements

| ITEMS                                | FEDERAL<br>Insurance Contributions Act<br>(Old Age Benefit Tax)<br>Employment by other than Carriers  | FEDERAL<br>Unemployment Tax Act<br>(Unemployment Compensation)  | CALIFORNIA<br>Unemployment Reserves Act   |  |
|--------------------------------------|---|---|---|--|
| COVERAGE—<br>(Defined<br>Employment) | <b>Employer</b><br>One or more employees (Includes Age 65 retroactive to 1/1/39).   | <b>Employer (Only)</b><br>Of 8 or more for 1 day in each of 20 weeks (includes all officers, except unpaid honorary officers).              | <b>Employer</b><br>Of 4 or more for 1 day in each of 20 weeks (includes paid officers, and paid directors if fees in excess of \$20.00 per diem, or all officers and paid directors any amount, if employer subject to Federal Act.)<br>(1) (2) | <b>Employee</b><br>Under same conditions covering employer.                                  |
| WAGES                                | 1st \$3,000 taxable wages from each employer. <i>Effective with taxable year 1940</i> , refund due of tax paid on wages in excess of \$3,000. (3) | 1939—Total taxable wages paid for services performed after Dec. 31, 1938 (4).<br>Beginning 1940—Only 1st \$3,000 paid to each employee. (4) | 1939—Total taxable wages.<br>Beginning 1940—Only 1st \$3,000 paid to each employee.   | 1939—Total taxable wages.<br>Beginning 1940—Only 1st \$3,000 received from each employer.    |
| DIRECTORS' FEES                      | Exempt—(when reasonable).   | Exempt—(when reasonable).   | Exceeding \$20.00—taxable. All fees taxable if employer is subject to Federal Act, as above.  | Exceeding \$20.00—taxable. All fees taxable if employer is subject to Federal Act, as above. |
| TAX                                  | 2%—1942-1945  | 2%—1942-1945  | 1%—1939 and each year. (Not in excess of 5% employer's general  | 1%—1939 and each year. (Not in excess of 5% employer's general                               |

taxable if employer is subject to Federal Act, as above.

1938-1940-2.7%  
1941 and each year-2.7% or following merit rates (5):  
2 1/2%-Reserve  
7 1/2%-Reserve  
9%-Reserve  
1 1/2%-Reserve  
10%-Reserve  
10 1/2% to 11%  
11% or more

1938-1940-2.7%  
1941 and each year-2.7% or following merit rates (5):  
2 1/2%-Reserve  
7 1/2%-Reserve  
9%-Reserve  
1 1/2%-Reserve  
10%-Reserve  
10 1/2% to 11%  
11% or more

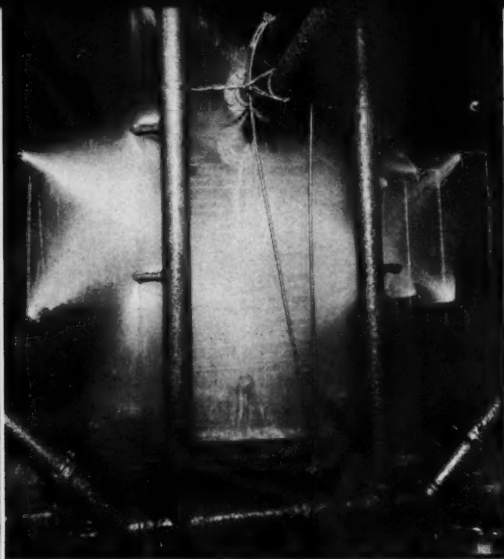
1938-1940-2.7%  
1941 and each year-2.7% or following merit rates (5):  
2 1/2%-Reserve  
7 1/2%-Reserve  
9%-Reserve  
1 1/2%-Reserve  
10%-Reserve  
10 1/2% to 11%  
11% or more

|   |   |   |   |   |   |
|---|---|---|---|---|---|
| 1938-1940-2.7%<br>1941 and each year-2.7% or following merit rates (5):<br>2 1/2%-Reserve<br>7 1/2%-Reserve<br>9%-Reserve<br>1 1/2%-Reserve<br>10%-Reserve<br>10 1/2% to 11%<br>11% or more   | (Memo.) Tax is deductible on employer's State and Federal income tax returns.   | (Memo.) Tax is deductible on employer's State and Federal income tax returns.   | (Memo.) Tax is deductible on employer's State and Federal income tax returns.   | (Memo.) Tax is deductible on employer's State and Federal income tax returns.   | (Memo.) Tax is deductible on employer's State and Federal income tax returns.   |
| Form SS-1a/1b. Quarterly Return and Payment due last day following month.   | Form SS-1a/1b. Quarterly Return and Payment due last day following month.   | Form SS-1a/1b. Quarterly Return and Payment due last day following month.   | Form SS-1a/1b. Quarterly Return and Payment due last day following month.   | Form SS-1a/1b. Quarterly Return and Payment due last day following month.   | Form SS-1a/1b. Quarterly Return and Payment due last day following month.   |
| Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  | Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  | Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  | Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  | Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  | Statement to employee quarterly or annually (within 2 months thereafter), on with each payment of wages, showing name of employer, name of employee, period covered, total wages, amount of tax. (Penalty—Maximum \$5 for willful failure to furnish.)  |
| Effective on Jan. 1, 1940 (maximum total benefits, \$85.00; minimum, \$10.00), retirement after age 65—<br>(1) Primary Monthly Benefit to fully insured individual (6)—<br>40% of net \$50.00 of average monthly wage (7), plus<br>10% of net \$200.00 average monthly wage, plus<br>1% of total of above amounts for each year of covered wages of \$200.00 or more.<br>(2) Supplementary Monthly Benefits (8)—<br>(a) To wife—50% of husband's benefit, if age 65, living with husband, providing she is not receiving, in her own right, a benefit equal to or larger than this supplement.<br>(b) To insured's child—50% insured individual's benefit, if dependent and under 18, and's benefit if such widow was living with husband at time of his death and not remarried if (a) is age 65, or (b) has care of child (of deceased husband) entitled to benefit.<br>(c) To dependent parent (if no widow or dependent child)—50% of decedent's primary benefit if parent is age 65, not since married.<br>(3) Lump-Sum Death Payments—If no qualified survivor as listed above—Amount equal to tax times decedent's primary benefit will be paid to or distributed among entitled survivors, etc. | Employee, etc.<br>Effective on Jan. 1, 1940 (maximum total benefits, \$85.00; minimum, \$10.00), retirement after age 65—<br>(1) Primary Monthly Benefit to fully insured individual (6)—<br>40% of net \$50.00 of average monthly wage (7), plus<br>10% of net \$200.00 average monthly wage, plus<br>1% of total of above amounts for each year of covered wages of \$200.00 or more.<br>(2) Supplementary Monthly Benefits (8)—<br>(a) To wife—50% of husband's benefit, if age 65, living with husband, providing she is not receiving, in her own right, a benefit equal to or larger than this supplement.<br>(b) To insured's child—50% insured individual's benefit, if dependent and under 18, and's benefit if such widow was living with husband at time of his death and not remarried if (a) is age 65, or (b) has care of child (of deceased husband) entitled to benefit.<br>(c) To dependent parent (if no widow or dependent child)—50% of decedent's primary benefit if parent is age 65, not since married.<br>(3) Lump-Sum Death Payments—If no qualified survivor as listed above—Amount equal to tax times decedent's primary benefit will be paid to or distributed among entitled survivors, etc. | Employer (only)<br>Effective 12/1/39—5-day notice extending waiting period for: (a) voluntary leave—balance of week of leave and week following; (b) discharged for misconduct—balance of week of leave and for not more than 5 additional weeks.<br>Employee (only)<br>Effective Dec. 1, 1939<br>\$10 to \$18 per week (per table in law) based on wages of \$75 to \$340 (or over) per highest quarter of base period, total payments limited by total wages each base period (per table in law).<br>Waiting Period—2 weeks (normal).<br>Base Period—1st four out of last five completed calendar quarters preceding benefit year.<br>Benefit Year—Fifty-two consecutive weeks from date of proper filing for benefits. | Employer (only)<br>Effective 12/1/39—5-day notice extending waiting period for: (a) voluntary leave—balance of week of leave and week following; (b) discharged for misconduct—balance of week of leave and for not more than 5 additional weeks.<br>Employee (only)<br>Effective Dec. 1, 1939<br>\$10 to \$18 per week (per table in law) based on wages of \$75 to \$340 (or over) per highest quarter of base period, total payments limited by total wages each base period (per table in law).<br>Waiting Period—2 weeks (normal).<br>Base Period—1st four out of last five completed calendar quarters preceding benefit year.<br>Benefit Year—Fifty-two consecutive weeks from date of proper filing for benefits. | Employer (only)<br>Effective 12/1/39—5-day notice extending waiting period for: (a) voluntary leave—balance of week of leave and week following; 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FOOTNOTES TO REFERENCE NUMBERS IN CHART

- (1) A California non-resident corporation—subject to Federal Act (having 8 or more employees), having less than four taxable employees in California would be taxed in California.
- (2) Effective June 20, 1939, "unpaid officers" have been eliminated as "employees" in determining employer's liability for California Unemployment Insurance Tax which exempts an employer from liability, unless, (a) employer's 1938 or 1939 "employment" would have made him liable therefor regardless of counting of unpaid officers, and (b) unless employer is subject to Title IX of Federal Social Security Act.
- (3) Claim for refund to be filed by employee within 2 years after taxable calendar year, covering tax paid by him on wages in excess of \$3,000 from all employers.
- (4) Prior to 1939 Amendments, tax was measured by wages paid or payable covering employment for the calendar year.
- (5) Based on average of annual total taxable payroll for the three preceding years, or the five preceding years, if higher.
- (6) A fully insured individual—one who had earnings of at least \$50 in one calendar quarter for each two calendar quarters since 12/31/36 (or since becoming age 21 if later) to the calendar quarter of date of death or upon attaining age 65 (minimum coverage six quarters) or, has had at least forty quarters of coverage. A currently insured individual—one who had earnings of at least \$50 for a minimum of six calendar quarters of the twelve quarters immediately preceding calendar quarter in which he died.
- (7) Average monthly wage (maximum \$250)—Total Taxable Wages (1937-1939—maximum \$3,000 per annum from each employer; after 1939—maximum \$3,000 per annum from all employers) for period 1/1/37 to calendar quarter of death or upon attaining age 65, divided by 3 times number of quarters since 12/31/36 to quarter of death or upon attaining age 65 (excluding any quarter having wages of less than \$50 prior to age 22, and any quarter after quarter attaining age 65 prior to 1939).
- (8) Such benefits are subject to limitations and restrictions regarding other benefits which may be accruing to such beneficiary. (See SSAA—Sec. 202.)





Air conditioning in deep mines has constituted a tremendous step in improved air hygiene. Above—the spray chamber for dust elimination at 3,600 ft. level air conditioning unit of Anaconda's Mountain Con mine, Butte, Mont.

# AIR HYGIENE in the MINING INDUSTRY

● *Although Knowledge Is Sufficient to Control Silicosis in Many Industries, Some Essential Details Are Still Lacking*

By LEROY U. GARDNER, M.D.  
Director, Saranac Laboratory

**L**IKE all higher animals man has evolved in an environment polluted by variable amounts of dust. As a consequence he has developed mechanisms which prevent his lungs from becoming clogged with foreign materials which would interfere with their proper function. These mechanisms include filters which exclude many particles from entering the respiratory tract, a special type of ciliated cell lining the larger air tubes whose activities carry dust particles away from the lung, free moving mobile dust cells or phagocytes which gather up and carry particles out of the pulmonary air spaces and finally a drainage lymphatic system to transport foreign matter to nodes located outside the lungs. These combined mechanisms provide adequate protection against ordinary atmospheric pollution, but industry has thoughtlessly created such high concentrations of dust in the atmosphere that the protective devices fail and dust often accumulates inside the lungs.

Mining is one of the oldest industries where hazards of this kind have occurred largely because of the lack of ventilation. For centuries disease of the lungs was accepted as an inevitable consequence of underground employment. Fortunately disease must have developed slowly, for hand drilling produced comparatively little dust and human tolerance is high. But the introduction of machinery and particularly the pneumatic drill created so much disease that the problem became serious to management. In

periods of labor shortage, like that following the Boer War in South Africa, it precipitated a crisis. Such situations together with the general awakening of social consciousness during the past 40 years led to a demand for remedial measures. It resulted in an intensive study of the incidence and cause of "miner's consumption."

As a consequence of this study it is now accepted that all dusts are not equally dangerous; that free silica, usually as quartz or flint, is the pre-eminent cause of pulmonary disease; that, while free silica produces severe reactions in the lungs, silicosis itself does not kill its victims and may not even disable them, and, finally, that silicosis is particularly dangerous because it specifically predisposes its victims to tuberculous infection. In recent years certain American writers have questioned the latter generalization because the manifestations of tuberculosis in the silicotic subject may be different from those in an otherwise normal one. Their challenge, however, has not shaken the faith of those best acquainted with the condition.

Further research is defining the conditions under which free silica produces its harmful effects upon the lungs. It has been proven that while particles as large as 10 microns in diameter may be suspended in the atmosphere and inhaled into the lungs, only those 3 microns and less in diam-

eter cause much damage to the tissues. Experiment has proved that in general as the particle size decreases the rate of tissue reaction increases, indicating a relationship to the amount of mineral surface in contact with the body fluids.

## Tentative Permissible Limit of Dust Count

It has been shown that the concentration of silica in the air must exceed certain undefined limits before disease will develop in a working lifetime. Tentatively the maximum permissible limit has been set at 5 million particles per cubic foot of air, but this standard may not be applicable to all exposures and may have to be revised as experience accumulates.

It is recognized that exposures have to be continued for years before evidence of silicosis become manifest. The rate of tissue reaction is modified by the concentration and size of the silica particles and by the character of the other minerals associated with it in the atmospheric dust. Under extraordinary conditions producing excessive concentrations of very fine and very pure silica dust, disease may develop within a two-year period but it then appears with unusual anatomic manifestations. In ordinary mining operations in the past it never appeared in less than three or four years and now exposures of nine, ten or twenty years are more commonly reported.

Pathological studies of persons dying with silicosis have defined the forms of the disease in the normal and the infected lung. They have shown how subsequently developing tuberculosis or other infection has modified the pattern of disease. Without this fundamental knowledge, the X-ray film which constitutes the most reliable evidence of silicosis during life, could not be interpreted intelligently.

#### Varied Patterns Assumed by Silicosis

This audience is hardly interested in the varied patterns which the disease assumes. It is sufficient to realize that there are three main types of change registered as shadows on an X-ray film. Briefly they are characterized as follows:

(1) The accentuation of the shadows of the branching tree-like blood vessels in the lung which may be produced by a variety of causes, including reaction to inhaled dust of any kind. While such changes may be produced in the early stages of reaction to silica they are so often due to other causes that they have little diagnostic significance.

(2) The discrete nodular fibrosis of uncomplicated silicosis characterized by the presence of round, sharply defined shadows, not over 4 to 6 mm. in diameter, uniformly distributed throughout all parts of both lungs.

(3) The so-called conglomerate fibrosis in which large localized shadows develop in one or both lungs usually upon a background of generalized nodulation. Opinions differ as to the cause of all types of conglomerate fibrosis but there is always a suspicion of complicating infection either in a healed or active phase.

Serial X-ray examinations of groups of exposed workmen, repeated year after year, have demonstrated the manner in which the disease develops and emphasized the significance of its earliest manifestations. They have indicated an unexpected frequency of complicating infection which often gives rise to no clinical symptoms in silicotic subjects.

Surveys of different industries are pointing out the wide distribution of silicosis and are determining its incidence in simple and complicated form.

#### Effects of Protector Substances

Animal experiments have reproduced silicotic fibrosis and provided a tool for controlled investigation. Such experiments have demonstrated the principles governing reaction to silica and other dusts and have made it



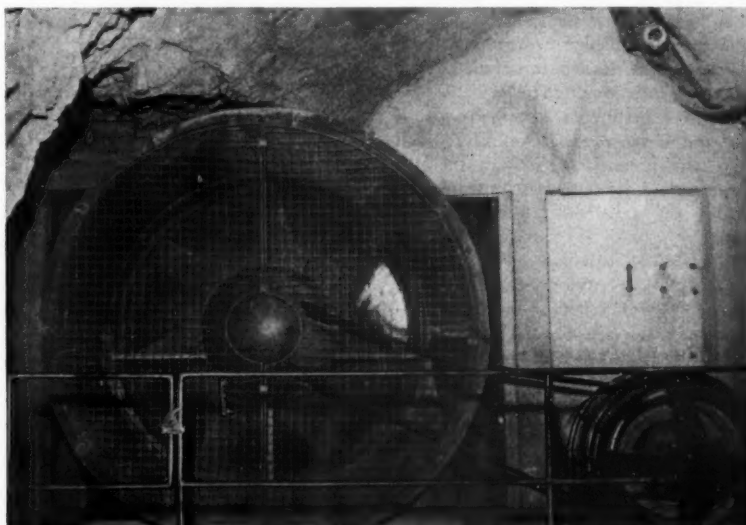
Ventilation has been greatly improved recently at Miami Copper Co.'s mine in Arizona, by this Aerodyne fan

possible to investigate the effects of protector substances which could hardly be done on human subjects.

Recent research has emphasized that other minerals associated with silica in the atmosphere are not merely inert diluents but that they govern the amount of silica that is inhaled, modify the anatomical form of the pulmonary reaction and perhaps alter the symptomatology.

Experience is demonstrating that the clinical picture of silicotic subjects in different industries is not always identical. As a general rule men with uncomplicated silicosis of the discrete nodular type are not disabled and exhibit no serious symptoms. There may be exceptions in types of disease produced by certain combinations of free silica and other minerals. Persons with conglomerate forms of

silicosis are almost always short of breath and incapable of severe muscular effort. Even active infection may not produce as acute symptoms as in non-silicotic subjects, and in the case of tuberculosis the causative organisms may not be eliminated in the sputum for a long time after they are established in the lung. This knowledge makes diagnosis difficult, but there is no disagreement as to the importance of an active infection. Sooner or later it causes disability; and even if it heals, the scar is apt to alter the course of the silicosis. Open cases of tuberculosis must be removed from contact with their silicotic fellows for obvious reasons. Infection of any origin makes silicosis serious, and tuberculosis is particularly hazardous. The problem today is one of putting in practice the well tried



Another Aerodyne installed on the 1,300-ft. level at Tintic's Eureka Standard mine, Dividend, Utah—affording fresh, clean air to the miners

procedures for combating tuberculosis.

A cure for established silicosis is hardly within the realm of possibility, for the disease, when recognized clinically, consists of innumerable nodules of scar tissue scattered throughout the lungs. These scars, produced by the action of silica, are composed of leather-like fibrous tissue which is much more dense than scars of any other origin. No drug or other form of treatment now known could dissolve them.

#### Prevention Only Reliable Means for Combating

Today prevention remains the only reliable means of combating silicosis. Others in this audience are experts in the use of water, ventilation and respirators to prevent dust from forming and reaching the lungs of miners. The physician's part in prevention is equally important. His findings in the lungs of exposed workmen are proof of a hazard. He can select individuals free from infection and otherwise capable of withstanding exposures to dust. He must detect evidence of complicating infection and determine whether disability exists. He must decide where men with different degrees of pulmonary involvement should work. His is the responsibility of controlling the spread of infection, which means supervision of not only the workmen but of the entire community in which they live.

#### New Control Methods Being Probed

New methods of control are under investigation, but they are still in an experimental stage. The discovery that other minerals associated with quartz in atmospheric dust will modify its action has led to detailed study of their influence. The widely proclaimed experiments of Denny, Robson and Irwin proved beyond a doubt that the presence of metallic aluminum would prevent quartz from irritating the cells and producing scar tissue. Apparently the conditions defining such inhibitory action are exacting, for experiments in the writer's laboratory have failed to confirm these observations. With aluminum hydroxide, however, animals have been completely protected for a period of a year and more. On the other hand, although there has not been the slightest suggestion of silicotic reaction in either group of experiments, it should be borne in mind that no experiment has fully evaluated the influence of the factor of

time. The longest period of observation reported by the Toronto investigators was only 17½ months. Similar experiments with a siliceous rock like Barre granite, whose potentiality for producing silicosis in human beings is notorious, has demonstrated that it also fails to produce fibrosis within 22 months. It would appear that some element in this rock acts as a temporary inhibitor, for the doses employed in experiments contained 300 times the quantity of quartz necessary to cause fibrosis in pure state. This concept is strengthened by the prolonged exposures necessary to produce silicosis in the granite industry; employment from 12 to 20 years is regularly reported.

In the writer's opinion the study of the inhibitory action of aluminum is

living tissue. If it could establish contact with quartz already inside the lung it would prevent further reaction, but there are no grounds for believing that it could "dissolve" existing scars.

#### Essential Details Still Lacking

While enough knowledge has now accumulated to control silicosis in many industries there are still essential details that are lacking. Opinions differ as to the mechanisms by which silica irritates the tissues, although many believe that its solubility is responsible. The question of individual susceptibility remains an enigma, although its solution is of utmost practical significance. The diagnosis of activity of the infectious complications and a determination of their



Liberal use of ventilation tubing in mines affords a concentration of fresh air where it is most needed—at the face or up in the stope

a fertile field for investigation. The presence of this element in siliceous rocks may explain some of the paradoxical lack of reaction to dusts of high free silica content. But the influence of aluminum has not yet been investigated sufficiently to warrant its use in place of the better known methods of prophylaxis. To evaluate its influence in human beings would involve an experiment which might prove disastrous to a generation of workmen. There is probably little harm in the use of aluminum as an adjunct to other methods of prevention. To expect that this substance could have any curative effect upon silicotic fibrosis which has already been established would be optimistic. Its demonstrated effect is to neutralize the silica so that it fails to irritate

seriousness in individual cases is often difficult. The discovery of an adequate method of treating the tuberculosis which complicates silicosis would be an achievement of major importance. To establish equitable codes of permissible atmospheric dust concentrations much more must be learned about the physical behavior of mixtures of silica and other mineral particles in air-borne suspensions.

#### Copper Refinery Resumes After Strike

Full operations were resumed late in November at the Perth Amboy copper and lead refining plant of the American Smelting & Refining Company, which had been shut down since October 10, owing to a labor strike.



# Considerations in Selection of MECHANICAL LOADERS

**W**HEN considering the subject of loading broken rock by mechanical methods in mines or tunnels, the operator or engineer should tabulate his conditions so that he may select from the various kinds of equipment available the particular type and size which will give best results. Probably the easiest way to approach this problem is to consider briefly the advantages and disadvantages of all best-known devices, and the particular class of service for which each is most suitable.

So much has already been written about what is commonly called "scraper loading" that the term is almost self-explanatory. This equipment usually comprises a two- or three-drum air or electric hoist working a scraper in connection with a loading slide, or direct into pockets or bins. Since this device is not readily portable, its greatest success has been achieved in loading out of large stopes, stock piles, etc., or in transfer work where a large tonnage can be moved from a single set-up. The hoist is sometimes attached directly to the loading slide, thereby making the unit easier to move about; but in any case where the amount of tonnage to be obtained from a single set-up is relatively small, the time required for moving this equipment about and setting it up for operation usually prohibits economy in such service.

Another variety of underground loading machine, usually electrically operated, comprising some type of loading element which discharges onto a short built-in belt conveyor, has found a wide application for handling rock in large tunnels and, with some modifications, for handling either coal or rock in coal mines. The chief disadvantages of this type of loading machine are its relatively high first cost, and the fact that the elaborate electrical equipment required for successful operation is a source of trouble, especially in wet operations. Swinging-boom shovels, powered by electric,

diesel or gasoline motors, are often highly efficient for use in very large tunnels, stripping operations, quarries, etc., but are hardly within the scope of ordinary underground practice.

A more recently developed type of underground loading machine which is widely used by metal mining companies throughout the world, and which has recently established a notable record for high-speed, low-cost mining in several important rock tunnels, is the compact, air-operated shovel-type loader, now available in two sizes. The action of this machine is such that each size has a definite maximum width of clean-up, although almost any width can be cleaned up efficiently by using two or more loaders operating side by side on parallel tracks.

## Auxiliary Belt Conveyor Useful in Narrow Tunnels

Since the operating principle necessitates bringing the bucket over the top of the loader body, head room for the smallest-size loader must be at least 6½ ft. above the track. The size of the car to be loaded is also a determining factor in selecting the size of the loader to be used if it is to discharge directly into the car. A recent development in the application of this type of loader has been the use of an auxiliary belt conveyor, with a hopper into which the loader discharges, and which carries the rock over the top of a sufficient string of cars to contain all of the rock from an entire round. The cars are loaded one by one from the discharge end of the conveyor—the entire trip being pulled forward intermittently by a storage battery locomotive as each car is filled. The Thompson-Markham Company, using this method of handling broken rock in a 20,000-ft. water tunnel having an 8½-ft. by 8½-ft.

cross-section, is mucking out and hauling away all of the rock from a 6-ft. round in from 30 to 45 minutes. Another advantage of this conveyor method of loading is that there is no necessity for passing cars in the tunnel, thereby eliminating the usual expense of taking out additional rock to make room for switching facilities.

Height and width of the heading are determining factors in the selection of the loader, but it is obvious, also, that its possibilities for high-speed operation depend greatly on adequate car service. In the average mining operation any other method than direct loading into cars, and their removal one by one as loaded, usually complicates the operation beyond the point of efficiency.

In the case of the water tunnel already mentioned, the use of auxiliary belt conveyors is amply justified by the fact that maximum speed is desired, and because the finished size of the



Auxiliary belt conveyor for use in tunnels with mechanical mucker



Above—Mucker in operation at face of Olmstead tunnel in conjunction with mobile conveyor. Loader is not attached to conveyor, but moves backward as required to discharge rock into hopper



Left—Discharge end of conveyor, showing gantry track and mine-car track

tunnel permits no turnouts or switching room. Any enlargement from the finished size must be filled in and concreted at the contractor's expense. Since this installation is highly successful and has already aroused considerable interest among other tunnel contractors, some further details may be given to advantage. Each of the two headings is equipped with a loader which operates by compressed air and is self-tramming, backward or forward, within the limits of the air hose connection. The loader dumps into the hopper of the air-motor-driven belt conveyor, but is not coupled directly to it as when loading into a single car. The belt-conveyor structure is mounted on wheels which run on a "gentry" track wider than the mine car track so that the mine cars can pass under the entire length of the

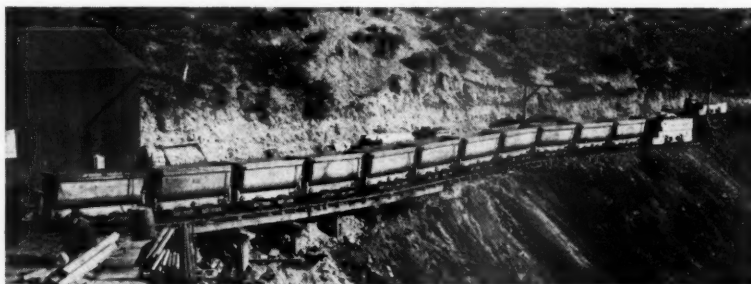
belt conveyor except under the hopper itself. The hopper is hinged so that it can be raised up to allow the loader to pass out under it if necessary. In this particular tunnel no drill carriage is used, but if necessary, a drill carriage could also be passed out under the conveyor structure. This would be necessary, of course, in order that the loader could replace the drill carriage at the face of the heading after the round had been fired. The drill carriage can either be pulled entirely out of the tunnel during the mucking operation or can be moved back to a switch, when sufficient room is available.

directly into the car and by having one or more locomotives available for changing cars rapidly. At one such tunnel, now being driven near Salt Lake City, a mechanical mucker loads three-ton cars in from 40 to 50 seconds, and the average time required for changing cars is less than 40 seconds. 16 three-ton cars were loaded recently in 21 minutes, although this speed can only be achieved when there is sufficient broken rock in the face for the loader to function at full capacity. If the tunnel width exceeds the clean-up capacity of the largest-size loader, two machines are used, side by side, with a double track leading to the face, and a double cross-over switch for car service. The double cross-over switch can be made up as a unit, mounted on steel plate, and pulled forward, as required, by the loading machines.

Outstanding advantages of the shovel type loader are its low first cost, low operating and maintenance expense, and simplicity of operation enabling practically any workman to become a skillful operator in a short time. All important working parts are enclosed in massive steel housings where they operate in a bath of oil; wear is very low so long as the proper oil level is maintained. Ten thousand tons of rock can generally be handled between overhaul periods, and for the purpose of depreciation their useful life may be estimated at from 5 to 7 years. Maintenance costs are confined almost entirely to replacement of buckets, bumper springs, cables, and other relatively inexpensive parts which can usually be replaced on the job by any experienced operator.

#### Rapid Car Change Recommended for Wider Tunnels

In wider tunnels where there is sufficient room for normal switching arrangements, best results have been secured by having the loader discharge



Mine cars used in Olmstead tunnel. Entire string is pushed under conveyor and loaded in quick succession when pulled forward one by one, removing all rock from 6-ft. round

#### Anaconda Operating Nine Butte Mines

The Anaconda Copper Mining Co. is now operating nine mines at Butte, Mont., including the Anselmo, Badger, Belmont, Leonard, Mountain Con and St. Lawrence (all copper mines), and

the Emma and Orphan Girl zinc mines.

Principal production comes from depths of 2,500 to 3,000 ft., but in some instances ore extraction is much deeper. The Mountain Con mine is the deepest operation, going down to over 4,000 ft.; a notable feature at

this property is the elaborate air-conditioning system, greatly improving the working conditions at these depths. A view of the surface plant of the air-conditioning system at Mountain Con is shown on the cover of this issue.

# Application of the WAGE-HOUR ACT to MINING

**W**ITHIN less than a month, I have been asked to discuss the Fair Labor Standards Act of 1938 with both the employers and workers, a circumstance which may be taken as evidence that employers and workers alike recognize that they both have a considerable stake in the success of the law that puts a floor under wages and a ceiling over hours.

What is it that you employers of labor really want? I suppose you want a variety of things, but so far as labor relations are concerned I think I am correct in saying that you want dependable, healthy and efficient workers. Certainly you do not want the channels and instrumentalities of commerce used to spread ill health and inefficiency among your employees. You do not want commerce and the free flow of goods in commerce burdened. You do not want unfair competition in commerce based upon starvation wages. You don't want destructive labor conflicts burdening commerce or interfering with the free flow of goods in commerce. And, finally, you do not want interference with the orderly and fair marketing of goods in commerce.

These are the things you do not want. They are also the things the Fair Labor Standards Act sought to eliminate. And therefore Congress uses its powers under the interstate commerce clause "to correct and as rapidly as practicable to eliminate the conditions above referred to in such industries without substantially curtailing employment or earning power." Such is the declaration of policy Congress wrote into the Act.

Yet we should not forget that we dig iron and coal out of the ground so that we can bring them together

By **ELMER F. ANDREWS**

Administrator  
Wage and Hour Division  
U. S. Department of Labor

and thereby produce steel. But we don't want steel except as a means to an end. The social justification of industry—any industry—is that it contributes to the happiness, the health and the welfare of the people; and it is difficult to think of any reason why any industry should be a matter of common concern unless it, somehow, can contribute to one of those larger ends.

No law of nation-wide application was ever enacted that did not entail a certain degree of hardship upon some of those it affects. No such law could be enacted. When Moses received the tablets on Mount Sinai there must have been numerous dissenters. "Thou shalt have no other gods before Me." Think of the bad news that must have conveyed to the makers of golden calves and graven images! Coming down the centuries to these times consider the many readjustments required by the Social Security law. And yet within four years the opposition to it virtually has ceased.

The test of the desirability of any law is this: Is it just to the individual? Is it just to the whole people? In the light of these considerations, may we not test the Fair Labor Standards Act? What are its achievements to date: It has raised the wages of many thousands of American workers. It has eliminated excessive hours of employment for a number which we cannot definitely calculate. It has added millions of dollars to the mass buying power of the people.

So far as the metal mining industries are concerned, I don't think you have been having any difficulty about the minimum wage requirements of the law. I don't suppose any member of

this Congress within years has paid as little as 25 cents an hour, or even as little as 30 cents an hour—the standard which becomes effective in October. However, some of you are having trouble with the maximum hours provision. And because you are having some trouble about hours some of you may have leaped to the conclusion that the law itself is unsound, or that it ought to be amended so as to make a special exemption for metal mining.

In a general way, I am familiar with the arguments. Many of the mines, especially the smaller ones, must be operated continuously if they are to show a profit. To add an additional shift would be economic suicide. The cost of subsistence in the mining camps for additional workers would be prohibitive. Moreover, if working hours were shortened, some of the men might stray away on their days off and never come back. Besides, much of the underground work is highly skilled and can only be done effectively by one worker, or one group of workers. It would be hazardous to attempt to solve the overtime problem by sending men into the mines who are unfamiliar with the customary techniques and the topography of the mine shaft. To pay time and a half for overtime in excess of 44 hours a week (42 hours after next October 24) would be prohibitive. Moreover, the men themselves don't want either a 44- or a 42-hour week. They enjoy working overtime. They wouldn't know what to do with themselves if they were given a couple more hours off each week.

The ease with which employers have been able to read the minds of their workers, to tell us exactly just what they do or do not want in the

\* Digest of address presented to Annual Metal Mining Convention of the American Mining Congress, Western Division, Salt Lake City, Utah, August 31, 1939. Read in the absence of Mr. Andrews by Wesley O. Ash, of the Wage-Hour Division.

† Mr. Andrews was succeeded by Col. Philip Fleming as directing head of the Wage-Hour Administration in mid-October.



way of hours and working conditions, has deeply impressed me. But the curious thing about it is that the workmen themselves haven't told us these things. We have received no communications from the miners, so far as I am aware, demanding that the Wage and Hour law be repealed, or that it be drastically amended. When I addressed the miners at Denver they didn't come to me after the meeting and tell me these things. It is remarkable, to say the least, that only the employers should be able to psychoanalyze these people and tell us their inmost thoughts.

As a matter of fact, we have received communications from the representatives of the miners that they support the law, have benefited under its provisions, and do not want it amended to provide exemptions for the industry. Shortly before I left Washington I received just such a letter from the secretary of one miners' local here in the West.

It is significant, I think, that these particular miners are looking beyond their own immediate benefits from the law to the benefits that will accrue to workers in other industries and to the country as a whole. This is not to say, of course, that no problem exists when it comes to the business of arranging practical hourly working schedules. I am not trying to belittle the problem, but I do suspect that it is not as difficult as some of you think and that further experience with the law may demonstrate to you that your fears, in part at least, are unfounded.

While we recognize that some of the suggestions we have made to the American Mining Congress, as to how the mining industry may accommodate its operations to the strict re-

quirements of the Act without payment of any overtime compensation, have not adequately met the problems with which all of you are confronted, you must believe me when I say that those problems have been a matter of very real and studious concern both to our economists and legal staff in the Wage and Hour Division. That study of the needs of the industry for greater flexibility in working schedules is continuing and we solicit your cooperation. What we desire from the industry are facts upon which we can base our efforts, and not arguments. To furnish objective data will require greater effort than to furnish arguments, but I am sure you will find the effort worth while. We shall communicate with you to solicit such information as you can give us.

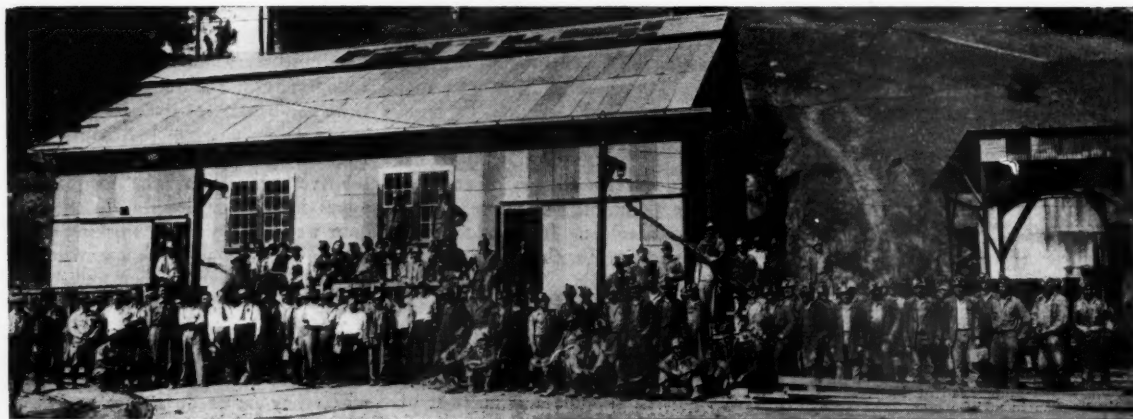
We ventured to suggest one method by which, it seemed to us, it might be possible to meet the working requirements of the industry without hardship as to the overtime payment requirements. We pointed out that the law is flexible. While it requires that no employee may be worked more than 44 hours a week without payment of overtime, there is nothing in it fixing the hours that may be worked in one day. We suggested that the workweek might be fixed so that an employee may work 11 consecutive days of 8 hours each and then lay off three days. By way of illustration, we pointed out that Jim Brown's workweek might be fixed so that he would start work at noon on Saturday, and at the same time the following Saturday. Brown's working hours would be from 8 a. m. to 4:30 p. m. with a half hour out for lunch between 12 and 12:30. He would work Monday, Tuesday, Wednesday, Thursday and Friday and Saturday

morning of one workweek, and Saturday afternoon, Sunday, Monday, Tuesday, Wednesday and Thursday of the following workweek. He would then lay off Friday, Saturday and Sunday, and resume the same schedule on the following Monday. The only limitation on this plan would be that the workweek could not be changed unless the change is intended to be permanent.

In the same manner, a mine operator, by beginning the workweek for different employees or groups of employees at different times and thereby working one group of employees while another group is off, might operate continuously 21 hours a day (if he established three seven-hour shifts) or 24 hours a day (if he established three eight-hour shifts) without being required to pay any overtime compensation.

And then, of course, you are aware of the flexibility as to hours conferred by the Act [Section 7 (b) (1) and (b) (2)] where certain types of collective bargaining agreements are in force.

Some of the mine operators have found that our suggestions do give them a way out. Naturally no single plan that we can offer will fit the practical needs of every mine operator in the country. However, we have laid down certain guiding principles as to the definition of the workweek, when it may begin and when it may end. It may be that with the definition of the workweek in mind, and the intimate knowledge they possess of their own operations, an employer and his employees may together devise a work schedule which will be convenient to the employees and which will meet the hours requirements of the Act without calling for any over-



time payments. I think it is a pretty encouraging thing about the ordinary American worker that he will cooperate in any sporting proposition that is for the mutual advantage of himself and his employer.

I am not one of those who maintain that the Wage and Hour law is perfect in every detail, that it cannot be improved in a single sentence or by the subtraction of a single comma. However, industries seem to be getting along without benefit of special privileges and exceptions, and some that last autumn were cocksure they would never survive under the Fair Labor Standards Act obviously have adjusted their operations to the new order of things and are not having the trouble they anticipated.

I should regret to see any ill-considered changes in the Fair Labor Standards Act. Almost every industry can make out some sort of a case against certain of its features. But if Congress yielded to all such clamors for exemptions, first to one and then another, the time soon would come when the protection, both to industry and to workers, which was written into the statute in accordance with the conscience of the people, would be whittled away and we would be back where we started. I personally should not wish to see sweeping amendments made before we have had more experience with the law and can appraise all of its effects. And if and when the time comes to amend, I think we should be extremely careful to see that the amendments accomplish exactly what we wish to accomplish, without opening the door wide for the chiselers and the sweatshoppers to sneak through.

One reason why I think the presumed hardships to the metal mining industries have been exaggerated is the fact that employment in it has steadily increased this year over last.

I do not say that this improvement was due altogether to the Fair Labor Standards Act. But by the same token you certainly cannot maintain that the Act discouraged the industry and curtailed employment.

Shorter hours may have had an adverse effect on the stability of employment. If so, it can only be a temporary effect. But first of all it should be said that the mining industry never has been known to possess a high degree of labor stability, and it should further be said that it was the very factor which certain members of the mining industry now hold up as making for stability which pro-

duced the opposite effect. It is not normal for men to work unremittingly for long periods of time without relaxation. Only men who prefer to work when in some way constrained to do so, will attempt it—without in the end really doing it. As soon as they have a stake they "blow." The result is a steady stream of men into and out of the industry.

Long before the Fair Labor Standards Act was enacted the automobile was beginning to alter this situation. The newly acquired ease with which men could come and go, as a matter of course, started to attract a group of men with family ties and other normal associations. These men know how to work and play in moderation and in the end make much more

dependable workers than the easy-come, easy-go miners of the old tradition. Shorter hours are likely to hasten the change. For the time being the change may be causing some trouble, but in the long run it is all to the good—all to the good both to the industry and to the society it is intended to serve.

Are we to conclude now that the necessity of snipping a couple of hours off the workweek is so great an obstacle to our expanding enterprise that we must helplessly surrender before it? Of course not. We will take it in our stride and march on to new conquests over poverty and disease toward that bright day when all men shall share more abundantly in the riches of our continent.

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## DISCUSSION

### C. A. DYE

President  
Tendoy Copper Queen Syndicate

### JOSEPH W. WALTON

Vice President  
Hillside Mines

### LEVERETT DAVIS

Vice President  
Cornucopia Gold Mines

### PAUL H. HUNT

Park Utah Consolidated Mines Co.

### HERBERT L. FAULKNER

Counsel  
Alaska Miners Association

### IRVIN E. ROCKWELL

President  
Minnie Moore Mines Co.

### WESLEY O. ASH

Regional Administrator  
Wage-Hour Division  
U. S. Department of Labor

**C. A. DYE:** In Lemhi County, Idaho, all mining operations are small, employing from 3 to 70 men each, hence my comments refer to small and remote operations.

With such small crews and the remote places in which most of the operations are conducted, the impossibility of staggering shifts or having resort to other maneuvers in order to comply with the requirements of the Wage-Hour Law, result only in reduced earnings for the men per month without the employment of more men. The loss of operating time has resulted in reduced income for shipping properties at a time when taxes are climbing faster than one can keep track of them.

Probably half the men employed in the mines of the county have claims

of their own. During the summer they ask for from two weeks to several months off so they may work their own ground. Prior to the enactment of the Wage-Hour Law with its restrictions and consequent reduction of earnings, they worked for the most part eight hours in 24 and seven days per week, with an occasional day off, planning to have enough money when the time arrived so that they could get out and do such work as they might on their own ground, or hire it done. No amount of sweet explaining justifies the law to these men who are often responsible for the opening up of a property which employs a sizeable number of men. They look on the law much as they looked on the prohibition fiasco—a jackassical interference with their rights.

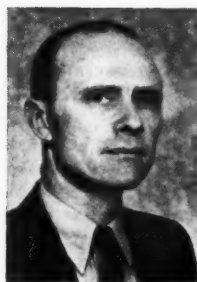
At my own property several men have gotten together a number of times and asked for the privilege of working seven days, straight time. They deeply resent interference with their right to work. One of them—a hoist man—voices the opinion of the majority when he argues with me: "A working man has no way to make money except to work, and he has to do a lot of work to support a family and maybe save a little for the days when he can no longer work. I have a wife and three babies and I would like to buy her a washing machine, and I could do it if you would let me work full time as I used to."

There is no question in the mind of any reasonable man that it is desirable to spread work amongst as many men as possible. Probably in some sections the law has had or may have that effect, even though it cuts earnings so that men who formerly earned enough to enjoy a few of the better things now find they can barely meet living expenses. Neither is there any question nor hesitation about calling an ambulance when a drunken driver runs amuck through congested traffic and injures innocent bystanders. Many of the regulations and restrictions of recent years belong in just that class, hence some remedy is justified. But, no intelligent person feels that calling ambulances will cure the basic difficulty—even a child comprehends that elimination of the drunken driver is indicated.

We need less swinging of clubs at the heads of all business, more of a willingness—if actual helpfulness is too much to ask of rabid theorists and amateur economists—to permit all business to get rolling and under way without building new hurdles every few months for the business machine to negotiate. Given just slight encouragement, business will take up all the slack in employment before the Wage-Hour administration finds out what it is all about.

Over many years there has been gradually developed in the metal mining industry a program of wages and hours that fits the peculiar conditions obtaining therein, and under which both operators and men have been living with little friction and much satisfaction. Generally this has meant eight hours' work in 24 for five, six or seven days per week as conditions require or permit.

Right here I would like to say something about the stability of the metal mining industry. Mining is a basic industry which, with few exceptions, depends on the fabricating industry and the manufacturing in-



C. A. DYE

dustry for continuous employment, and when they are able to operate continuously metal mining won't have to be worried about stability in its employment.

Substantial wages—above any minimum contemplated in the law—and reasonable hours should not be lightly interfered with. Each operation presents different problems—no two are alike. Climate varies, remoteness from transportation, towns and sources of supply and entertainment also vary with each operation. No law can possibly be administered so as to function fairly to all of them—no man is, in my opinion, competent to devise such a law. Therefore I see no justice in forcing something on men and operators that neither desire and that cannot be helpful to either of them. Keep in mind that I am speaking of remote and isolated communities.

When a man must make a 50 to 200-mile round trip to get to a town which is probably just a post office, he isn't likely to want a day off every week or two just because some law tells him he can't work on that day. And who will fill his place if he takes that day off? Is the operation supposed to shut down and lose several hundred dollars thereby in addition to depriving the crew of wages for that day? And to what good? Time and a half, as required by law, in case men work this extra time, is out for the small operation. It can't stand the cost.

Further, it is utterly impossible to hire men to work two or three days or even four days per week on isolated operations, loaf and pay board during their idle time in a camp where little or no recreation can be provided or drive to and from a spot on the map that may be just a post office or a general store. Of course a saloon will spring up near by if the camp grows. The law might consider that sufficient recreation for working men.

In the main—and I think this is a matter that most of the people who

are attempting to enforce these laws overlook entirely—in the main, metal mines do not control the price at which their product is sold. The price of gold is set beyond the ability of any operator to change it, and the same is true of other metals. Further, every shovelful of ore taken from a mine shortens the profitable life of the property by just that much. Profit must be made during the life of the deposit. Broadly speaking, costs (of which wages are the major part), volume and percentage of recovery are the only factors over which an operator may exercise control. Added taxes or increase in other costs cannot be passed on to an all-consuming consumer as may be done in most any other industry—they must come out of profits during the limited life of the mine.

Hence any increase in costs is a serious matter in metal mining and time and a half, imposed *merely as a penalty* to force the employment of more men when more cannot be had or cannot be used to advantage or cannot be housed, is unfair and unreasonable. And when this penalty results in lessened earnings for men who made more before the law than they are now permitted to make you are generating active opposition to and disrespect for the law and its administrators.

Ignorance of the problems of metal mining or indifference to them is no excuse for an unfair law. One can only conclude that this law is the result of the efforts of a fresh batch of politicians just learning the rudiments of economics and trying to make us believe that two plus two make six, or maybe eight, if we will shut our eyes. It is my honest and considered opinion that the only answer is to exempt metal mining entirely from the operation of the law.

**JOSEPH W. WALTON:** During the last few days I have been very much interested in listening to the various talks that we have had from this platform, and there have been two statements that I have heard that have stuck in my mind. One of them was by Senator Pittman in which he said that the mining fraternity must hang together, and that recently it seems to have gotten to a point where we are all hanging together.

The latter part of April of this year I went back to Washington to see if I could help out anywhere in





JOS. W. WALTON

any of these conditions. I was like a lamb being led to the slaughter. I didn't know what I was going into, and I want to thank the American Mining Congress for being so nice to me when I went back. I did what I could, and at one time we had a conference with Mr. Andrews and several of the western congressmen, along with several men interested in the mining industry, and representatives of the American Mining Congress. I notice that Mr. Faulkner of Alaska and several others who attended that conference, are present here.

The first objection that came up was from a man from Colorado. He made the statement that they had a great many mines up on the tops of mountains that were inaccessible for a good many months of the year and that he thought that all mines that were above 9,000 or 10,000 feet should be exempt from this act. Shortly afterwards we heard from Alaska. There they have mines in the Aleutian Islands off the coast of Alaska, and for a good many days and weeks of the year it is impossible to get communication from the island to the mainland. That meant that we had gone from about 9,000 or 10,000 feet down to sea level in an awful hurry.

Then they decided that the only way to answer this was to refer to them as isolated communities. The question then is, what constitutes an isolated community? The Administrator, Mr. Andrews, very frankly told us that he did not want the job of determining what was an isolated community, and I don't blame him.

One thing that has come up—I am sorry that Mr. Andrews isn't here, for I would like to ask a specific question (I hope Mr. Ash may be able to answer me)—and that is, aside from this method that he mentions in his paper, there was another method that has been talked about a great deal, and that is whether a man is allowed to work six hours with time and a half for the other two hours overtime

work seven days a week (a total of 56 hours) and have the reduction in base pay plus the time and a half for the two hours' overtime each day be the same as the wages were that he had been receiving prior to the Act. I have never been able to get an absolutely definite answer from the Wage-Hour Administrator as to whether that can be done or not. Sometimes I think that he thinks it can, and sometimes I think that he thinks it can't, so if he doesn't know I know that I don't.

During the last session of Congress there were two bills that were introduced. Neither of them passed. One of them was the so-called Norton Bill with amendments—H. R. 6406, put in on May 18, 1939 and amended on July 27, 1939. In this bill the following amendment was put in section 3:

Section 7 of the Fair Labor Standards Act of 1938 is amended by adding at the end thereof the following:

"(c) No employer shall be deemed to have violated sub-section 'a' by employing any employee for a workweek in excess of that specified in said sub-section without paying the compensation for overtime employment prescribed therein if such employee is so employed in mining or milling of non-ferrous metallic ores or operations incidental thereto, and if such employee receives compensation for employment in excess of 56 hours in any workweek at a rate of not less than one and one-half times the regular rate at which he has been employed. This sub-section shall apply only if the place of such employment, either by reason of high altitude, remoteness from established settlements, climatic conditions, or otherwise is relatively difficult of access."

That brings us back to the same problem that I spoke about a few minutes ago, that I am sure no one, including the Administrator, wants the job of saying which are and which are not inaccessible.

On July 24, Mr. Ramspeck of Georgia introduced a bill in the House of Representatives, H. R. 7349. That bill, amending the same section in the Act states:

"No employer shall be deemed to have violated sub-section 'a' by employing any employee for a workweek in excess of that specified in said sub-section without paying the compensation for overtime employment prescribed therein if such employee is so employed in mining or milling of non-ferrous metallic ores or operations incidental thereto, and if such employee receives compensation for employment in excess of 56 hours in any workweek at a rate of not less than one and one-half times the regular rate at which he has been employed."

That leaves out the last sentence of the Norton bill, which applied to the remoteness. This eliminates all of that.

It is my hope and desire that the mining fraternity as a whole, as stated

by Senator Pittman, will work together and try to get this identical amendment either in this bill or in some other bill through the Congress of the United States. The only way that we can do that is for all of us to keep our shoulders to the wheel, and try to push it through to the best of our ability.

**LEVERETT DAVIS:** Before going into a few of the difficulties that we have had with this law, I want to express to Mr. Ash my appreciation of the reception that we have invariably had from the Wage-Hour Division on every matter that we have referred to them. It is very different than we have had from some of the other governmental departments. Frankly, I don't like the law; at the same time, the men who are administering it have met us half way, have been uniformly courteous, and apparently have done everything within their power to straighten out the difficulties that we have had.



LEVERETT DAVIS

We operate a mine that is not as isolated as some of the properties that Mr. Dye referred to, but which nevertheless in the wintertime offers some difficulties in getting in and out. Our normal snowfall is in the vicinity of 25 feet, most of which stays on the ground. Obviously, therefore, it is impractical for the men to go out for a short time. They can't take a car in the wintertime and run out after shift. We gave the matter of the law considerable thought and study, and finally adopted several changes in our operating schedule.

It occurred to me that in the mine proper we might be able to speed up the work and increase the efficiency sufficiently to accomplish in six hours at the face what had previously consumed a total of eight. A number of the men were called into conference and we discussed the matter rather fully and agreed to attempt such a schedule. Previously our operating schedule had been on the basis of 13 days' work out of every 14; in other words, we shut down 24 hours every two weeks. That had been worked

out over many years as being the most efficient and satisfactory arrangement. We told the men that if they could produce a satisfactory tonnage in the six hours at the face that we would go permanently on this schedule. The result has been very successful. Within two weeks after this change was made, our production per man was up, we have accomplished more work and the men themselves are enthusiastic and take a pride and interest in their work.

It is impossible, situated as we are, to put on enough extra men to make up in other departments for the hours that we had to shut down. We are somewhat isolated and every time that we add an employee we have to provide housing facilities for him. In general, our employees are married men, and we have tried to make living conditions comfortable for the families. We have some single men and some whose families are not there who live in the bunk houses, but the majority of our employees live in homes that are provided by the company and are more comfortable, really, than the small homes that the same class of men would have in the larger centers.

The financial position of the company does not permit building a large number of houses at one time, although a few are built every year. We have our own power plants, three in number, which provide power for the operation, and also have our own shops for construction and maintenance of equipment. Many of our employees, therefore, are not actually employed in the mine, and some of these men previously worked seven days a week. It is some of these men who feel the effects of the law.

I might say here that we have a somewhat different type of operation than many others, in that it is no particular hardship for us to shut down our mill, and we worked out, therefore, by increasing capacity somewhat on a five-day schedule in the mill. Our average mill employee receives \$5 for eight hours' work. He then gets his two days off each week. That made a reduction in his earnings from \$35 to \$25 weekly, or a direct loss to him of approximately 30 percent. Common and unskilled laborers outside get \$4 a day, or 50 cents an hour. Cutting them from an average of six and a half days to five days cuts their wages from \$26 to \$20, or an average of 23 percent. Our skilled employees, such as welders, diamond drillers and caterpillar operators get a dollar per hour and it has cut them from an



Isolated nature of Cornucopia mine is indicated by the above—hauling concentrates down a 2-mile road with a 1,200-ft. drop to the small village of Cornucopia, Oreg.

average of \$52 per week to \$40, or approximately 23 percent.

Mr. Andrews stated that the Wage-Hour Division had not had a single complaint from employees relative to this law. I wish that he could sit in my office when some of these men come in and talk to me about it. They say they can't get by. We have no high school, so they have to send their children away to high school and to college, and they say they can't continue to keep their children in school with the cut that they now have to take, and the consensus seems to be that it doesn't do any good to appeal to Washington. They may as well save the energy and the postage because nothing constructive ever comes of it. They frequently come in and ask if we can't put them into some other department for two days each week. We have to tell them that it is not a question of changing them from one job to another, but of not allowing them to work.

In the past, in general, the custom has been for our employees to work along pretty steadily for some months, perhaps, and then to take a number of days off. In that connection I will say that all our older employees get two weeks off with pay every year, and at other times during the year they frequently would come in and want maybe a week off. They would work for three or four months, and then they would go out and be gone for a week, coming in first and making arrangements as we have certain extra men that can always fill in, and the arrangement has worked out very satisfactorily. By taking the extra time it allows them to get clear out—

maybe down to the coast where there is no snow. They would even take trips to California, but that has virtually ceased since this law went into effect. Today, as a matter of fact, average earnings are down, and having this extra time, the tendency is to spend a little extra money, and very few have enough left to take these trips.

Mr. Andrews states that he assumes that we want dependable, healthy, efficient workers and that we don't want ill health and inefficient, unfair competition and starvation wages. By implication I assume that he means that this law will accomplish all of those things and that without it such would not be the case. I personally take exception to that statement because I think the average progressive employer realizes and has realized that only through building up a loyal and efficient organization is it possible for him to operate and continue in business.

I will say for the wage-hour law that there are certain categories of people that are certainly greatly in favor of it in our community, and I am speaking only for ourselves. I am not competent to speak of industry as a whole, and I suppose that if actually this law does greatly benefit industry as a whole, those of us who are inconvenienced by it and those individual employees who are suffering, whose earnings are cut down because of it, should feel that that is their contribution towards a great social uplift. Personally, I don't believe that, except perhaps in isolated cases, such is the case; however, as I started to say, there are certain classes in our community that do favor this law. Those are saloon keepers, the operators of the pool halls and those ladies of easy virtue that infest every mining camp. The men have a lot more time, and the result is that they hang around these various places more than was previously the case, and spend more money therein.

We have seen a very material difference in the well being of many of our employees. The grocery stores and the dry goods stores tell us that the purchases of the individual employees have been considerably cut down. Then, too, the stores are having more trouble in collecting their accounts than previously.

In spite of the statements by Mr. Andrews on the subject, I believe that the majority of our employees do not feel that the passage of this law has benefited them.

**PAUL HUNT:** I would like to state our difference in experience from the last speaker with regard to the efficiency in shortening hours per day.

A number of years ago here in Utah our law was changed so that the underground shift consisted of eight hours from collar to collar. Many of our mines have long tunnels, and this operation results in about six and a half to six and three-quarters hours actual working time at the face. Our results have shown a very marked decrease in ore production per man and also in development per man employed. We have been unable to make up this difference by any changes that are possible.

With regard to the effects of the shorter workweek—that is, fewer days per week—I would like to comment on a few of the things that Mr. Andrews has said to us here. First, however, I think we should emphasize this fact: There can be no question but that the costs of mining operations have been increased by the Wages and Hours Act—not increased, of course, by any effects that the minimum wage law has, but by the hours. If in no other respect, it is going to increase our costs approximately 20 percent of our overhead. In addition to general overhead, you will find that just as much water has got to be taken care of, pumped or otherwise, on Saturday and Sunday as on Monday and Tuesday, and for some strange reason the ground makes water on those two days just as much as it does on the first days of the week. Probably that could be explained, but I am unable to do so, so that I am sure that we will find our overhead costs are increased by at least 25 percent if not more in most of our mining operations, and that is sufficient excuse for us as mine operators to go on record and say that from our standpoint it does increase costs. If we don't follow it out, ultimately those increased costs in our metals are going to be handed on to the consumer, thus tending to reduce consumption and production, which ultimately reacts on the worker himself in reduced employment.

I would like to take exception to two of the things that Mr. Andrews has mentioned. One of them is that they have received no complaints whatever from the men, and practically closing the door to our making any statements with regard to the feelings of our own men in the matter by saying that no doubt we are quite able to psychoanalyze the men

and tell this convention what they think about it. Prefacing my remarks, I would like to say that a few years ago at the Judge mine we polled our men on the following three alternatives, and told them we would follow the majority vote; namely, whether to: (1) continue as we were working at that time, 13 days in a two-weeks period, change day on Sunday, 24 hours off; (2) work six days a week, laying off every Sunday, or (3) work five days a week. Eighty percent of the men voted for the six-day week, and since then up to the time of the passage of this Act we have maintained the six-day week. So I think I am somewhat justified in saying that our men at that time did not like it.

I would like to present this for your attention: In the letter that Mr. Andrews has quoted at considerable length as being received by him from the secretary of a labor organization, I would like to have you note particularly the amount of space that that man gives to the fact that they are in favor of the law and substantiates it by saying that they have received at this particular place no reduction in their weekly wage; that is, they are getting as much for the 40 hours as possibly they were getting previously for the 48 hours. I should certainly like to have a poll made some time on how the men like to get a reduction such as our men in Park City have had—from six to five days' pay per week. To the average family that means a loss of gross income of \$20 to \$25 a month. Such a reduction means the difference between a family that enjoys most of the modern comforts and conveniences in the home, and a family that is limited almost entirely to just the bare essentials of living. It means the difference between a contented family—a family that feels that they are keeping abreast of the times and are enjoying the benefits of progress—and a family that think that in some way life is cheating them a little bit out of what rightfully should be theirs. It doesn't take any great subtlety for them to discover just why it is.

I had hoped this address of Mr. Andrews might go somewhat into the fundamentals of why this Wages and Hours law came to be enacted. I don't think there are any of us who question the moral duty or the legal right of a state to regulate wages and hours, or I will say hours. Regulate wages, yes, below a minimum; fix a minimum for wages, certainly, and to

regulate hours for the benefit of the health, physically and mentally, of the workman. There are none of us who question that at all, but I do seriously question the moral right of the state to regulate the days that a man can and cannot work; that a man must be idle, that he must spend 52 days of the year in idleness, and I am calling it by its true name. It is idleness—it isn't leisure. These men don't spend their 52 days in chasing butterflies or reading Greek tragedies. It is just as the previous speaker has said—they spend it down in some dump. They spend the money that should go to their families, and they are thoroughly dissatisfied with it. I know this for a fact, from the conversations I have had with many of them, and I do hope that perhaps we can get one of these surveys made—an unbiased survey as to what the actual feelings of the men themselves are.

I think we are perfectly justified in saying that our objection to the Wages and Hours law is that it has increased costs. That is enough, from our standpoint; nevertheless, some one should speak for the men themselves, and that some one is not the labor leaders. The labor leaders feel that if they can get shorter hours for the same weekly pay, and the men feel the same, why they would accept the shorter hours. But it can't be done. It is economically impossible to continue that for very long, and if it should be continued the only result will be higher costs—higher costs to the consumer, higher costs to the producer, and less employment for the worker, himself.

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**HERBERT L. FAULKNER:** I just want to offer one thought. I was in Washington last spring at the time Mr. Walton was there. We went to see what could be done about some changes in the Wage-Hour Act or to see what might be in store for us in the administration of it. I was representing the Alaska Miners Association, which is an organization of small operators—that is, operators employing a few men in small operations.

We had a conference with a number of Congressmen from the metal mining states, and Mr. Andrews. We brought up our problems to Mr. Andrews. They are the problems, as Mr. Walton has said, of the men who operate at high altitudes and the problems of the men who operate in remote areas and, as he said, it was



very difficult for any one to define what might be a remote area.

One thought that impressed me in Washington was the idea that this law is not workable. Mr. Andrews, himself, was very much in favor of certain amendments to the law. The House Labor Committee worked for many weeks in preparing certain amendments, which were approved by Mr. Andrews. The Department of the Interior seemed to be very much on the warpath about what the law was going to do with the needlework industry of Puerto Rico, and it was felt there that this law must be amended. Then later on they got into a quarrel over it, due to the fact that so many different groups wanted so many different amendments that there wouldn't have been anything left of the law. Each group felt that the change in the law he was sponsoring was essential to those whom he represented. So it occurred to me, without very much deep thought on the subject, that the law will not work. None of those amendments passed, and the law was not changed because there were so many changes demanded that nothing could be accomplished in that session of Congress. Therefore, I felt as I still feel, and I believe most of you men feel, that this is not a subject upon which there should be national legislation; it simply will not work.

Up in our area we cannot operate under this law. The operations are seasonal. Some of them last only about six weeks. We pay very high wages. As an illustration, I am indirectly interested in a small property there, and most of those men are skilled workers. They are brought in year after year, and make enough during the short session, which extends from six weeks to maybe five months, to keep themselves throughout the year. We pay in this little mine \$325 a month, plus board and lodging, and furnish transportation at a cost of about \$200 on the average. So you see the tremendous wages that must be paid up there. Here you have a law that classifies us with the corn shellers down in Texas where the industry will not stand for more than 20 cents an hour.

I say any law that will try to embrace all classes of industries in its hours or wage provisions is not workable.

The thought I want to contribute to this meeting is that there is nothing sacred or unchangeable about any law. When it is found that it will

not work, when it is seen that it will not work, it ought to be repealed. I don't think that this law can be amended, as you have seen from the recent session of Congress. I do not believe that it can be amended so as to be satisfactory to any section or to any group, to the administrator or to anybody else. I think we ought to be fair about it. Mr. Andrews was very fair in the meeting which we attended there. We stated our problems to him, and came away with the feeling that he was the proper man to administer the law if we must have such a law; that he would take into consideration our problems and our troubles up in our country. He has not interfered, and we must work up there while the sun shines and the water runs. We must work 10 hours a day, and those operations would have to close down if they were operated under the schedule of this law.

So I feel that the only way to treat this law is to repeal it and leave the matter to the states and the different localities to deal with each particular industry according to its needs.

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**IRVIN E. ROCKWELL:** Referring to that paragraph of no complaints, as illustrated by Mr. Andrews, I am very sure if the research field men had taken a canvass of the women in my camp whose husbands were employed in the mine, he would have found plenty of complaint; in fact, it is almost universal. This reduction of \$20 to \$25 a month in the current payroll envelope, as has been stated by one of the speakers this afternoon, means just the difference between comfort and discomfort. It means better clothes for the children, clean, better food on the table. It means those desirable things of life that they cannot have with their present reduced income. We were compelled under this law to limit the time to 44, and now to 42 hours a week. Just make a canvass of the women, and they will tell you the truth about how they feel.

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**WESLEY O. ASH:** Mr. Walton raised a question with which I am sure you are all familiar. It goes right to the heart of this Act. Unfortunately, I am not an attorney representing the General Counsel's office. The feeling of our General Counsel is that the hourly rate, as in effect September 24 last year, will not be

reduced for the purpose of avoiding the provisions of the Act. To answer a specific question such as raised today by Mr. Walton is difficult, since each situation varies. We could stay here all night going over individual cases. I do not feel that it is fair to the Act or to you people to try to settle an administrative policy over a radio loudspeaker like this. You can generate a lot of heat but probably not very much light. The basis, however, is that our General Counsel feels that the intent is that the hourly rate should not be reduced from what it was before the law was enacted.

I am only sorry that Mr. Andrews was not here to get all of these ideas. I am sure that is what he wanted—the more the better. I am sure that I reflect his policy, and I work here in the western states, in wanting everything out on the table. The facts developed show the issue, and I would like to suggest that in connection with this survey which Mr. Andrews intimates will be made, that the American Mining Congress, Mr. Dye and other people who are so full of these facts on the small isolated mine see that this information be channeled through an orderly fashion in some sort of a continuity following this meeting.

All of Mr. Andrews' men are just normal Americans; they have a certain job to do, and we are interested out here in seeing that they get at the facts. In other words, Mr. Andrews is strong on this decentralization idea. He doesn't want to run the country from an armchair in Washington, and that is the spirit running through the whole outfit. Neither he nor I can say that any given law enacted by Congress is inoperative. It is not up to us to say so. We haven't any authority. On the other hand, it is our policy to administer it with reason and fairness, and I am sure that that is the way you want it.

Nobody is on trial for anything so far as our work out here is concerned, but I would like to leave this one request—that some sort of a continuity relationship be worked out between this meeting and this proposed economic survey, which is for the purpose of developing facts which I imagine Mr. Conover and his associates in the American Mining Congress will give the Administrator as recommendations to Congress. Naturally, no economic survey made by his staff will change the laws. They can at least help to develop the facts which will give relief to the situation as the facts develop.

## With the

of the **AMERICAN MINING CONGRESS**

## MULTIPLE ROOM CONVEYOR UNITS

### ***A Report by the Committee on Conveyor Mining***

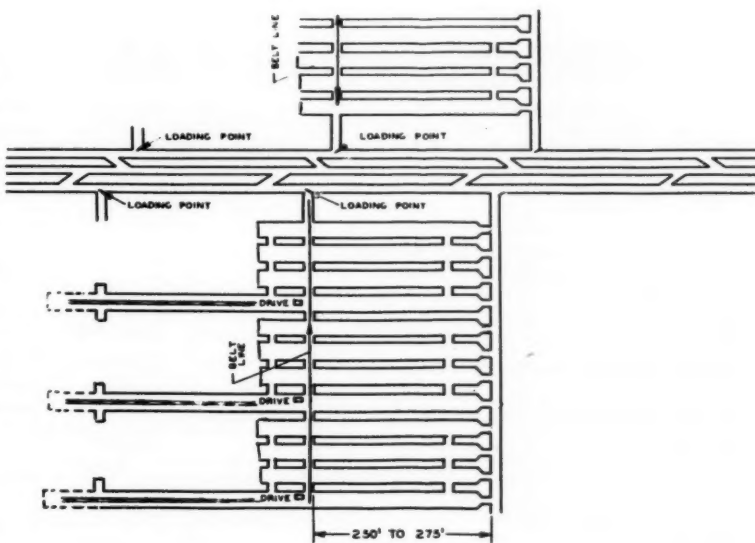
**T**HE Conveyor Committee has already submitted a portion of their report which is being prepared on conveyor mining plans, and the accompanying drawings are a continuation of this study. These drawings show multiple unit systems and illustrate two distinct methods used in this class of mining. Both systems have a long belt conveyor, onto which the room conveyors discharge, and which loads into a trip of mine cars.

The plan illustrated in Fig. 1 involves driving rooms to the right and left; the size of the panel, the number of rooms worked, and the room dimensions would, of course, be governed by local conditions. In this particular mine, because of an exceptionally hard and strong top, the rooms are 75 ft. wide, and the 35-ft. pillars between are not recovered.

Fig. 2 illustrates what might be termed a continuous advancing system, in which the belt conveyor entry is driven by the room units. The sketch shows three rooms working

simultaneously; as each room is completed, its conveyor is moved to the adjoining outby room. In this manner, four rooms are worked successively by each room unit, and on completion of the fourth room, the room conveyor drives and the belt are moved

ahead to the next single entry as indicated on the sketch. This single entry, as will be noted, is simply a series of breakthroughs driven in line between the rooms. The panel dimensions and the number of rooms worked can, of course, be modified.



### Figure 2

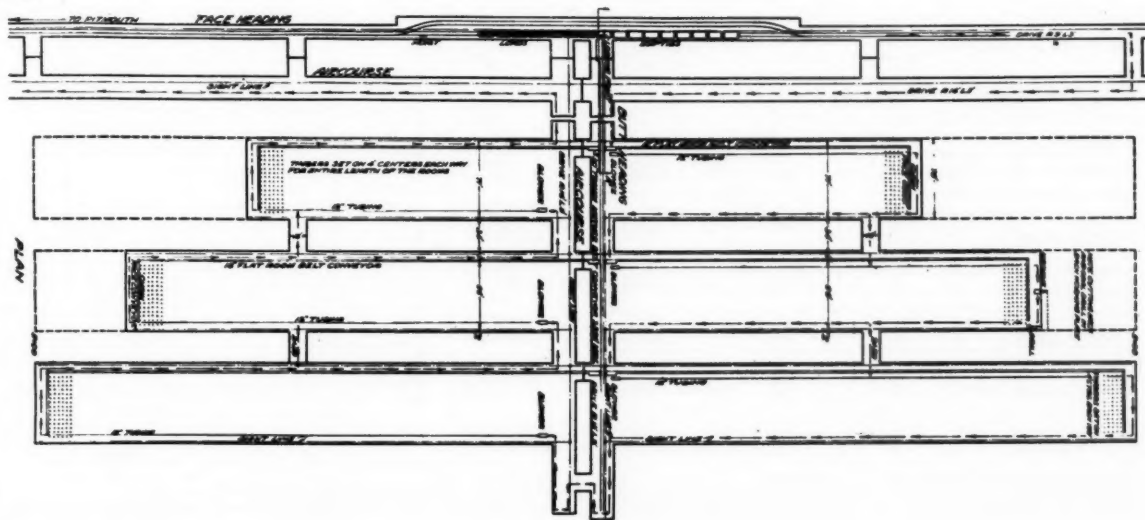


Figure 1

# MAINTENANCE OF MOBILE LOADING MACHINES

*A Report by the Committee on Mechanical Loading*

ONE of the most important requirements for efficiency in mechanical loading is to eliminate delays. As is well known, delays result from a number of causes; some are unavoidable, or at least partially so, while others, such as mechanical breakdowns, may be the result of the failure to take the proper preventive steps before the interruption happens.

One preventive measure is to see that each machine is working within the limit of the service for which it is designed and to use proper care in its operation. But no machine is perfect, and parts will naturally wear and break in the course of ordinary use. However, mechanical breakdowns should not customarily happen during the shift, nor should it be customary to make repairs during the shift. It is, therefore, of primary importance,

in getting a satisfactory operating performance, to recognize that machine parts will wear out and to plan accordingly.

It is the opinion of the Committee on Mechanical Loading that the answer to reducing mechanical failures is to have regular daily inspection, and that the machine runner should share this inspection with the electrical and mechanical department. The runner, through familiarity with his machine, can generally detect when some part is not performing properly, and his report to a repairman will serve to indicate needed work that an ordinary inspection might not reveal. On the other hand, an inspection by the maintenance department will frequently discover things which have not yet become apparent to the operator. Consequently, vigilance and interest on the part of both the machine runner and the repairman are essential in keeping the equipment in good order.

In order to systematize the inspection and maintenance work, the com-

mittee is recommending the use of two form sheets submitted below, which were prepared by a sub-committee under the chairmanship of S. M. Cassidy. The form shown in Fig. 1 is to be made out by the assistant mine foreman or section boss. On this is shown any needed repairs or adjustments which have been reported by the machine men. This report is filled in at the end of the day or shift and is given to the master mechanic. The second form, shown in Fig. 2, is made out by the repairman after he has completed his work on the machines.

The use of these two reports has been found very effective in developing a procedure to eliminate breakdowns during the shift. Their particular value lies in the fact that the machine crews and the repair crews are both made responsible for the condition of the equipment; in addition, the supervisory staff are furnished with a daily and detailed check on the mechanical performance of the various machines and the maintenance work.

| MOBILE LOADING MACHINE<br>REQUEST FOR REPAIRS |                |
|---|----------------|
| Mine.....                                     | Date.....      |
| Section.....                                  | Shift No. .... |
| NATURE OF REPAIRS NEEDED                      |                |
| LOADING MACHINE _____                         |                |
| _____   |                |
| CUTTING MACHINE _____                         |                |
| _____   |                |
| SERVICE LOCOMOTIVE _____                      |                |
| _____   |                |
| DRILLS _____                                  |                |
| _____   |                |
| POWER LINES _____                             |                |
| _____   |                |
| OTHER EQUIP. _____                            |                |
| _____   |                |
| UNIT FOREMAN _____                            |                |
| Give number and location of equipment.        |                |

Figure 1

| MOBILE LOADING MACHINE<br>REPAIRMAN'S DAILY WORK REPORT |                   |                       |       |
|---|-------------------|-----------------------|-------|
| Mine.....   | Shift.....        | Date.....             |       |
| Repairman.....  | Check No. ....    |                       |       |
| LOCATION  | Machine<br>Number | NATURE OF REPAIR WORK | Hours |
| SECTION   |                   |                       |       |
| Loader  |                   |                       |       |
| Cutter  |                   |                       |       |
| Drill   |                   |                       |       |
| Loco.   |                   |                       |       |
| SECTION   |                   |                       |       |
| Loader  |                   |                       |       |
| Cutter  |                   |                       |       |
| Drill   |                   |                       |       |
| Loco.   |                   |                       |       |
| SECTION   |                   |                       |       |
| Loader  |                   |                       |       |
| Cutter  |                   |                       |       |
| Drill   |                   |                       |       |
| Loco.   |                   |                       |       |
| Total   |                   |                       |       |
| Approved By _____                                       |                   |                       |       |

Figure 2



## REPORT ON RAIL BONDING

Submitted to the Underground Power Committee

(EDITOR'S NOTE: This report, prepared by L. W. Birch, is submitted to the Power Committee by H. P. Chandler.)

THE proper carrying capacity of the return line in an electrical circuit is of equal importance to that of the main feeders. Inadequate rail bonds form an obstruction to the flow of the return current which is roughly comparable to the effect of a restriction in a pipe line, and cause an increase in the mine power cost. Conversely, bonds larger than necessary have no beneficial effect on the power, and simply mean an added installation expense. These points are illustrated in the accompanying charts.

Chart 1 illustrates the comparative cross-section of a 4/0 trolley wire, two 40-lb. rails and 2/0 traction bonds with respect to conductivity. It will be noted that the conductivity or cross-section of the 2/0 bond is small as compared with the 40-lb. rail, thus illustrating that a restriction or added resistance occurs at the points where the bonds are applied. Since the copper equivalent of 40-lb. rail is approximately 400,000 c.m., the 40-lb. rail bonded with 400,000 c.m. bonds would show a solid line with no restriction where the bonds are attached. Briefly, Chart 1 shows at a glance a comparison of copper equivalents for an overhead trolley wire and two rails and the reduced conductivity at the rail joints.

On Chart 2 there is illustrated, in order of capacity, 8 bonds, the smallest being at the top of the column. The second column illustrates the comparative cost of 66 installed bonds and 1,000 ft. of track, the rail being 40-lb. In the third column will be found the power loss per 1,000 ft. of track for a 1,000-ampere load. Twenty-four hundred working hours have been assumed in these calculations. The cost of power at the motors is 3c per kwh. In the fourth column will be found the saving in dollars per 1,000 ft. of track over the No. 1 bond for various bonds of greater capacity for a circuit carrying 1,000 amperes. This column represents the saving in power loss less the additional cost of a larger bond. Bond No. 5 shows the greatest saving while No. 6 drops below No. 5, even though No. 6 is a bond of greater capacity. This is because it is necessary to make the No. 6 bond longer than the No. 5 bond, hence the resistance of the joint is raised rather than lowered.

In column 5 will be found the power loss per year per 1,000 ft. of haulage way, for a circuit carrying 500 amperes, while in column 6 will be found the saving in power over the No. 1 bond. It is to be noted that bonds 2, 3, 4, and 5 show approximately the same saving, while the larger bonds, 6, 7, and 8, show

should be made before the size of the bond is selected.

These charts are not submitted as a complete engineering study to determine the return lines in a mine circuit, as the factors of distance, voltage, capacity, number of machines, etc., all have to be taken into account in designing the power trans-

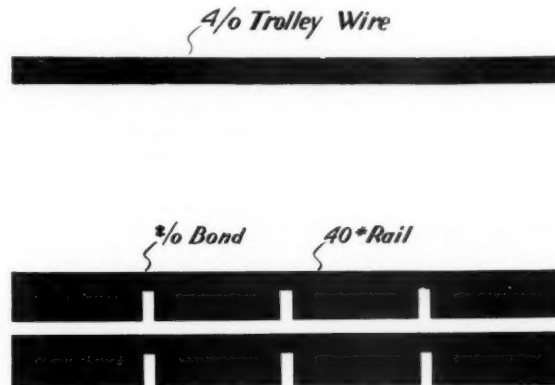


Fig. 1. Showing comparative cross section, with respect to current carrying capacity, of trolley wire, rail and rail bonds, and illustrating the restricting effect of small bonds in the return line

a loss over the No. 1 type. The loss is indicated by the cross hatching. Again this is due to a longer bond made necessary by the use of a larger diameter cable.

From the chart it would appear that the choice of bond capacities is limited, and a careful study of conditions

mission system for underground service. The purpose of the charts, however, is to emphasize the fact that real engineering for the return lines is just as necessary as it is for the feeders, and power costs can be reduced through proper design of the returns.

| Size Bond | Relative Cost of Bonds | 1000 Amp Load       |                     | 500 Amp Load        |                     |
|-----------|------------------------|---------------------|---------------------|---------------------|---------------------|
|           |                        | Power Loss Per Year | Saving Over #1 Size | Power Loss Per Year | Saving Over #1 Size |
| 1         | 33 <sup>00</sup>       | 68 <sup>91</sup>    |                     | 17 <sup>25</sup>    |                     |
| 2         | 39 <sup>60</sup>       | 53 <sup>46</sup>    | 13 <sup>34</sup>    | 13 <sup>36</sup>    | 1 <sup>70</sup>     |
| 3         | 46 <sup>20</sup>       | 45 <sup>41</sup>    | 19 <sup>55</sup>    | 11 <sup>28</sup>    | 1 <sup>75</sup>     |
| 4         | 52 <sup>80</sup>       | 34 <sup>45</sup>    | 28 <sup>12</sup>    | 8 <sup>61</sup>     | 1 <sup>76</sup>     |
| 5         | 59 <sup>40</sup>       | 29 <sup>70</sup>    | 33 <sup>96</sup>    | 7 <sup>42</sup>     | 1 <sup>39</sup>     |
| 6         | 72 <sup>60</sup>       | 35 <sup>64</sup>    | 20 <sup>60</sup>    | 8 <sup>91</sup>     | 4 <sup>34</sup>     |
| 7         | 79 <sup>20</sup>       | 32 <sup>67</sup>    | 2 <sup>46</sup>     | 8 <sup>17</sup>     | 5 <sup>69</sup>     |
| 8         | 85 <sup>80</sup>       | 23 <sup>76</sup>    | 12 <sup>80</sup>    | 5 <sup>94</sup>     | 5 <sup>39</sup>     |

Fig. 2. Showing comparisons between various sizes of track bonds with respect to installation costs and power costs. Note that in the last three items of the sixth column, the cross hatching indicates a loss instead of a saving



# WHEELS of Government

● *As Viewed by A. W. Dickinson  
of the American Mining Congress*

**W**HILE "Cactus Jack" Garner was pursuing his buck in the wilds of the Rio Grande region near Uvalde, Texas, his admirers were making medicine; and when the smiling countenance of the successful deer-hunter was framed in the edge of the timber on his triumphal return, the announcement of his candidacy for the Presidency of the United States boomed throughout the land.

Vice President Garner and his Senate and House conferees returned to Washington on January 3 to convene the 3rd session of the 76th Congress, and to listen to the Chief Executive's messages to Congress on the state of the Union and on the national budget. Both Houses desire as short a session as possible in this election year of 1940, and the general belief centers on June 15 as the best estimate of the probable adjournment date. Chiefly desired by the Administration is the extension of the foreign trade agreements authority which expires in June and toward which a stiffened resistance has been building up among agriculturalists, stock-raisers and the producers of natural resources. The usual departmental supply bills are up for consideration with about a one-half billion dollar increase for national defense, and the matter of increasing taxes is apparently to be held in abeyance until the latter part of March. There is a strong tendency toward amendment of the National Labor Relations Act to compel a more judicial procedure under that statute and to guide the activities of the National Labor Relations Board into more clearly defined administrative procedure. Also pending before the Congress are amendments to the Wage-Hour Act under which the workweek has now been shortened to 42 hours, decreasing again to 40 hours on October 24, 1940. Particularly in the natural resources industries the pressure is strong for the correction of this statute, which, while originally

aimed at certain sweated activities in the needle-work and similar trades, has created such havoc in our far-flung industrial structures.

## Taxation

Congressional Committee consideration of a Revenue Bill has been set aside at least until the latter part of March. The time of the Committee on Ways and Means will be occupied largely with consideration of extending the authority for making foreign trade agreements, which promises a lively battle in the House and a real show-down in the Senate.

The resignation in December of Treasury Under-Secretary John W. Hanes is taken by the majority of observers to mean that there will be no general revenue bill with corrective revision of tax irritants. It will also be remembered that Ways and Means Committee Chairman Robert Doughton stated at the close of the special session of Congress in November that he did not know whether there would be a revenue bill or not. However, in his budget message, the President called for additional revenue to cover the excess expenditures proposed for national defense. It is known that Administration leaders have discussed the imposition of a special supertax of perhaps 15 percent, which, if levied on the anticipated income tax receipts of about three billions, might produce approximately the revenue desired.

## Foreign Trade Agreements

The storm of protest which burst against the foreign trade agreement procedure of the State Department at the end of the special session of Congress in November spread throughout the country, and was accompanied by a serious repercussion in the copper-producing states. Fear of the effect upon American production of a reduction in the 4 cents per pound import excise tax under the proposed Chilean

Foreign Trade Agreement was reported to have affected business conditions in the mining states, and strong representations were made by Senators and Congressmen to the State Department in Washington. Led by Senator Carl Hayden of Arizona these protestants succeeded in wringing an unprecedented concession from the State Department on December 21, when it was announced that copper would not be considered as a commodity subject to negotiation for reduction in duty under the pending Chilean Trade Agreement.

With the zinc mines and smelters of this country facing serious consequences from the cut of \$7.00 per ton in the duty on zinc metal under the Canadian Foreign Trade Agreement effective January 1, 1939, there exists another excellent opportunity for the State Department to remedy the harm it is doing. The restoration of the zinc duty would immediately stimulate employment and bring about the resumption of exploration and development work for this metal which will be badly needed in an adequate national defense program.

The Committee on Ways and Means has announced that its first activity will be consideration of extending the authority for negotiating and proclaiming foreign trade agreements which expires in June. Sentiment in both the Senate and the House is strongly against the manner in which these treaties have been handled by the State Department, and it is quite possible that further extension of the authority will either be refused by the Congress or that the result of the State Department's negotiation will be made subject to ratification by the Senate as is the constitutional requirement in the case of all treaties with foreign nations.

## National Labor Relations Board

Virginia's Congressman Howard W. Smith, Chairman of the House Com-

mittee investigating the National Labor Relations Board, sprang a surprise in December by holding two weeks of hearings. This action by Chairman Smith caught the Investigating Committee's Counsel Toland before preparation for the conduct of hearings had been completed, but a sufficient showing was made to impress Administration leaders with the serious need for amendatory legislation.

National Labor Relations Board member William M. Leiserson in his appearance before the Committee criticized Board procedure and pointedly attacked the actions of the Board's Secretary, Nathan Witt, for his many improper actions. Leiserson, who is a fair, unbiased and experienced arbitrator of labor differences, stated plainly that there are too few employees of the Board who are experienced in practical labor matters. He further said that the staff is made up of an excess of lawyers who persist in a too legalistic approach when the real need is for common sense, round-table, man-to-man discussion.

Senator Wheeler of Montana in a speech made in New York on December 8 stated his belief that the National Labor Relations Act would be amended in the present session of Congress, and even CIO leader John L. Lewis has announced his desire for change. Lewis's proposed changes, however, are designed to make the Act even more stringent, and are said by some to have been urged mainly to confuse the situation.

#### Wage-Hour

Outstanding development of the past month in the Wage-Hour Division, Department of Labor, was the action taken by its administrative officer, Colonel Philip B. Fleming, to place a greater measure of authority under the discretion of ranking regional officers for the announced purpose of speeding up enforcement of the Act. About 400 inspectors for the Wage-Hour Division are now in the field, and this number will be increased under the nearly \$8,000,000 requested by the Division in the new budget estimate. A re-allocation has been made which divides the country into 15 regions under which the divisional office in Kansas City, with branch offices at St. Louis and Denver, will administer the Act in Colorado, Iowa, Kansas, Missouri, Nebraska and Wyoming. The regional office at Dallas, Texas, with a branch office at San Antonio, will cover Arkansas,

New Mexico, Oklahoma and Texas; and the San Francisco office, with branches in Los Angeles and Seattle, will administer Arizona, California, Idaho, Nevada, Oregon, Utah, Washington, Alaska and Hawaii.

As to further action on the proposed amendments to the Wage-Hour Act, Chairman Mary Norton of the House Labor Committee has announced that she will call her group together in two or three weeks for further consideration of the amendments which retain their status as of the adjournment date (August 3) of the first session. Representative Barden of North Carolina has announced that he intends to press for consideration of his amendment before the House Committee on Rules in continuance of the course taken by him at the end of the first session. It is too soon to predict what results may be accomplished in amending the Act,

but there are indications that Administration forces may be resigned to the necessity of taking some remedial step to correct this hurriedly considered and ill advised law.

#### Federal Mine Inspection

Senator Neely's Federal Coal Mine Inspection Bill, S. 2420, which was on the Senate calendar at the time of adjournment on August 3, is subject to action in the present session of the Congress. While the bill may pass the Senate, it is believed that resistance to the measure is so strong in the House Committee on Mines and Mining that it will not be reported by that body. In the meantime it is interesting to note that this bill, which was so ardently desired by Interior Secretary Harold L. Ickes, is reported to be the cause of the sudden

*(Continued on page 56)*

White House winter scene

—Horydczak







# NEWS and VIEWS

## Copper Excise Tax Not to Be Touched

The unprecedented announcement made by the State Department December 21 that Chile is to receive no import tax concessions on copper in the reciprocal trade agreement now being negotiated came as a complete surprise, and doubtless comprised the best Christmas present received by the countless numbers whose security was threatened by a possible cut in the protection now enjoyed by the domestic copper industry.

The announcement was made after consultation with the Chilean government and agreement by that government to make the announcement in advance of conclusion of the pending treaty.

Copper and copper products were among the articles listed for detailed study by the governmental experts charged with investigation of various commodities likely to be affected by a trade agreement with Chile, and an avalanche of protests were filed with the State Department in November. These were made not only by domestic producers, 11 of which filed a joint statement through A. E. Petermann, vice president of Calumet & Hecla Consolidated Copper Co., but also from a number of states dependent to a large degree upon mining as a means of livelihood and income. Labor also entered the fight against any cut, with the head of the CIO affiliate, the International Union of Mine, Mill and Smelter Workers, joining forces with the domestic copper interests.

## Northwest Miners Meet

More than 350 mining men from the northwest gathered in Spokane, Wash., December 7-9, for the forty-fifth annual convention of the Northwest Mining Association. Representatives were present from Idaho, Montana, Oregon, California, Washington, and British Columbia, all with the paramount interest of furthering mineral development of the northwest.

New president of the Association is C. O. Dunlop, of Spokane, formerly of Wallace, Idaho, succeeding Roger O. Oscarson in this office. Other new officers include: James F. McCarthy, Jr., Wallace, vice president; A. F. Bingenheimer, Spokane, treasurer; and A. W. Buisman, Spokane, secretary.

Included in the three-day conclave were addresses by the following men: "Recent Mine Developments in Montana," by Carl J. Trauerman, president of the Mining Association of Montana.

"Construction and Operation of the

Star Pointer Dredge," by King C. Laylander, manager of the Star Pointer Exploration Company.

"Operation of the Mines-to-Market Law in the State of Washington in 1939," by Thomas B. Hill, supervisor of the division of mines and mining.

"Aims and Activities of the Washington Prospectors and Miners Association," by A. A. Elmore, president of the Prospectors and Miners Association at Grand Coulee.

"Tungsten in the Bumping Lake District," by John W. Melrose, Division of Geology at Pullman.

"Mining Developments in Oregon in 1939 With Particular Reference to the Cornucopia," by Leverett Davis, vice president in charge of operations of the Cornucopia Gold mine.

"Legal Obstacles Encountered in Mine Financing," by Wellman Clark of Spokane.

"Pity the Poor Prospector—or Practical Advice to the Miner Seeking Money for Development," by Frank Lilly, mining statistician of Spokane.

A joint meeting of the Northwest Association and the American Institute of Mining and Metallurgical Engineers was held Friday noon, with J. J. Curzon, manager of the Chelan Division, Howe Sound Company, at Holden, Wash., speaking on "Mining Methods Used at the Holden Mine."

A stag banquet concluded the event, at which Donald A. Callahan, of Wallace, was toastmaster.

## General Electric Developing New Tungsten Operations

General Electric Company is endeavoring to expand its tungsten output through the development of a tungsten property in Lemhi County, Idaho, according to a report by Arthur Campbell, state mine inspector of Idaho. The property to be opened consists of a group of 24 claims located in the Blue Wing mining district, about one and one-half miles from Patterson in the Pahsimaroi Valley, in the same vicinity as the Ima mine, second largest producer of tungsten in the United States.

## Coal Division Hearings

During the past few weeks a steady stream of district board witnesses have filed before the Coal Commission presenting their objections to and recommendations for minimum prices. Authoritative sources reveal that these hearings

will be brought to a close during the week of January 22nd. At the conclusion of the hearings the trial examiners will present their recommendations and findings to Director Gray, who will send them to Secretary Ickes for review. Then announcement of price schedules will be made and a few subsequent hearings will be held. This is the final step before final promulgation of prices.

In sending the annual budget for the fiscal year ending June 30, 1941, to Congress, President Roosevelt recommended decreases for the Consumers Counsel and Bituminous Coal Division of the Interior Department. The budget points out, "These decreases represent economies resulting from reorganization, and the contemplated completion of the work of these divisions by April 25, 1941," the date of expiration of the present law. The budget message called for a cut of more than one million dollars in appropriations for the agency created to establish minimum prices for bituminous coal. This announcement brought speculation that the death of the Bituminous Coal Division in a little more than a year—unless Congress intervenes—is anticipated.

Director Howard A. Gray has cut the number of field offices in half, effective January 31. Cleveland takes over the work of the Saginaw, Mich., office; the branch at Wheeling, W. Va., goes to Fairmont, W. Va.; the Louisville, Ky., office is closed and work transferred to Indianapolis, Ind.; Kansas City gets the business formerly handled by Des Moines, Iowa, as well as that of Fort Smith, Ark.; Denver takes over the largest number of closed offices, including Santa Fe, N. Mex.; Cheyenne, Wyo.; Salt Lake City, Utah; Billings, Mont., and Tacoma, Wash.

Secretary Ickes and Director Gray have taken steps to eliminate possible legal controversy as to the finality of the minimum prices which are to be established. Gray announced that parties desiring could file exceptions to the director's order with the Secretary of the Interior. He stated that this further review will not delay the effective date of minimum prices since the Secretary will consider the exceptions during an interim period which must in any event elapse between the issuance of prices and their effective date, to give the industry an opportunity to familiarize itself with the price schedules and to readjust its own price lists and contracts. The director issued an order providing that exceptions may be filed within ten days after the issuance of the director's findings and order.

## Potash Bearing Government Lands Leased

Secretary of the Interior Harold L. Ickes late in November announced approval of three leases for approximately 6,000 acres of valuable potash-bearing areas of the public domain near Searles Lake, San Bernardino County, Calif., to the American Potash and Chemical Corporation of Trona, Calif.

The leases are for a 20-year period, with option for extending each 10 years thereafter, at the discretion of the Secretary.

Paving the way for increased production in the United States of this valuable fertilizer ingredient, formerly obtained in considerable quantity from Germany and other foreign countries, approval of the leases to the California corporation marked completion of negotiations begun at a public auction held at the District Land Office in Sacramento, on October 19, at which the American Potash and Chemical Corporation outbid the West and Chemical Company, offering a bonus bid of approximately \$130,000 for the acreage.

In addition to payment of the bonus bid, the corporation will pay royalty to the Government of 3 percent of the gross value of the potash production, estimated at point of shipment, as well as annual rental of 25 cents per acre for the first year, 50 cents during the next four years, and \$1 per acre thereafter. It is estimated that operations on the leased land will yield the Government more than \$50,000 in royalties annually.

## Mercury Consumption, Production and Stocks in October 1939

Consumption of mercury in the United States during October, 1939, totaled 2,800 flasks (76 pounds each), according to the Bureau of Mines, United States Department of the Interior. Consumers' stocks at consuming plants, in bonded warehouses and in transit at the end of the month amounted to about 8,500 flasks, or slightly more than three months' supply at the October rate of use. These figures are based on reports received from companies which are believed to account normally for more than 95 percent of the mercury used in the United States. Domestic production amounted to 1,500 flasks, imports were 200 flasks and exports 364 flasks, so that supplies made available in October fell far short of requirements. Indications are that domestic production will expand in November, and more metal is expected from abroad. Mercury dealers and importers reported having 2,400 flasks in stock at the end of October, or less than another month's supply.

Revised figures for September indicate that about 2,600 flasks were consumed during that month and 9,200 flasks were in stock at consuming plants, in bonded warehouses and in transit on September 30.

At the end of September dealers and importers reported having 3,000 flasks of metal on hand.

Domestic production of mercury during the month of October was approximately 1,500 flasks, unchanged from the September rate. This total is predicated on reports received from 34 mines, 30 of which accounted for 95 percent of the total output in 1938 and 4 of which did not produce in that year. This rate is almost identical with the monthly average of 1,499 flasks for 1938, when the total output was 17,991 flasks. Stocks held by the reporting companies dwindled from 318 flasks at the end of September to 178 on October 31.

California and Oregon supplied 80 percent of the total for October, production in California dropping 23 percent from the 1938 monthly rate, while that in Oregon was 3 percent higher. Increased activity in Arkansas and Nevada has resulted in larger supplies from those states, and Idaho is producing from a newly opened property there. As usual, Texas is contributing to the country's total.

Imports of mercury for consumption amounted to 200 flasks in October, and exports totaled 364 flasks. For the 10 months ending October 31, exports were 888 flasks and imports 612 flasks. Thus for the first 10 months of the year, exports exceeded imports, despite the tariff of \$19 a flask. This is the first time since 1931 that there has been an export excess. In that year the high price maintained for the metal abroad, coupled with the depression in the United States, resulted in a price differential in favor of selling in the London market. Of the exports in October, 134 flasks were consigned to Canada, 59 to Japan and 53 to Australia. Mexico supplied 145 flasks and Spain 50 flasks of imports in October.

## Aluminum Plant on West Coast

Plans were announced December 26 for the erection of an aluminum reduction plant at Vancouver, Wash., by the Aluminum Company of America, in order to provide for the increased demand for aluminum on the west coast. The plant will have an initial producing capacity of 30,000,000 pounds of aluminum annually, increasing the company's yearly peak capacity to more than 400,000,000 pounds. Cost of the plant will be of the order of several million dollars.

President Roy A. Hunt, of the Aluminum Company, said that arrangements had been completed for the purchase of a 200-acre plot of land in Vancouver, and that a contract had been signed with the Bonneville Power Administrator for 32,500 kilowatts of electricity.

It was reported in Washington that this is the first sale of Bonneville Power to a new industry, and Bonneville Administrator Paul G. Raver stated that the Aluminum Company contract guarantees the Bonneville project approximately \$10,000,000 in revenue over the next 20 years, and that there is good possibility of doubling the amount with plant expansion.

## Ima Tungsten Mine to Increase Output

Improvements now taking place at the Ima tungsten mine in Lemhi County, Idaho, will materially increase the capacity of the property to turn out tungsten concentrates and further strengthen its position as the second largest tungsten producer in the country.

According to a statement made by Owen Hickey, superintendent, the company recently completed a new tunnel 660 ft. long, 12 ft. wide and 9 ft. high, including 100 ft. of double tracking in the tunnel, all of 30-lb. rails.

With about 35 tons of new machinery to be installed about the first of January, the capacity of the plant will be about 40 tons of 65 percent WO<sub>3</sub> concentrates per month, in addition to 200 tons of sulphide concentrates. These enlarged operations will result in an increase of 20 more men on the pay roll, bringing the total to about 100 men.

## Joplin Men to Reopen Arkansas Zinc Mine

Preparations were being made late in 1939 to reopen the old Canton zinc mine, situated on Mill creek near Little Buffalo, Ark., the property having been leased by the Buffalo Mining Co., L. F. Richardson, of Joplin, is superintendent in charge of operations, and several Joplin men are interested in the company.

Some 30 years ago the Canton was one of the leading zinc mines in northern Arkansas, but it was closed during one of the slumps in the zinc market and never resumed operations.

New machinery and equipment are being installed in the 100-ton mill at the mine site, and underground operations were expected to get under way early in 1940. Concentrates from the mill will be trucked to Harrison, and thence by rail to Joplin, Mo.

## Garvey Heads New River Operators

J. W. Garvey, general manager of the Maryland-New River Coal Company at Winona, W. Va., was elected president of the New River Operators Association at their annual meeting held in Oak Hill, November 29. He succeeds Gilbert Smith, of Fayetteville, in this office. Other officers elected include: Ebersole Gaines, president of the New River Company, at Mt. Hope, vice president; S. C. Higgins, of Mt. Hope, secretary, and P. M. Snyder, of Mt. Hope, treasurer.

Comprising the executive committee are Garvey, Gaines, M. C. Milne, of Concho, Edward Graff, of Mt. Hope, P. C. Thomas, of Pittsburgh, Snyder, Austin Caperton, of Slab Fork, R. H. Morris, of Ansted, John Martin, of Charleston, and Owen Cox, of Laurel Creek.

Gaines and J. P. Williams, president of the Koppers Coal Company at Pittsburgh, were elected to the board

of governors of the Smokeless Coal Operators' Association.

Speaking at the meeting were President Charles E. Lawall, of West Virginia University, and Ralph M. Hartman, secretary of the state compensation commission.

### Washington College of Mines Institute to Meet

The Thirteenth Annual Mining Institute sponsored by the College of Mines, University of Washington, Seattle, will be held during the week of January 15. Meetings are scheduled at Mines Laboratory on the University campus each day except Saturday, when a field trip will be taken to some point of mining or metallurgical interest. Lectures and laboratory demonstrations are given by members of the staff of the College of Mines dealing with mining, metallurgy, ceramics, and related fields. Operators and engineers prominent in the industry present subjects dealing directly with operation; representatives of leading manufacturers display and demonstrate new equipment and machinery. Motion pictures are shown to illustrate current operations.

### Copper for Sewage Treatment

During the past 12 years copper and its alloys have been increasingly specified by engineers for many uses in the sewage-treatment field. Some of the earliest applications were for gates, baffle plates, weirs and screen plates where these corrosion-resistant materials proved eminently satisfactory. As a result, these metals are extensively employed in some of the largest sewage-treatment plants in the country.

Equipment used in these plants is subjected to highly corrosive conditions that may vary a great deal in different sections of the country. The copper-silicon alloys, which are widely used in sewage-treatment projects today, are being installed as the result of grueling tests under actual service conditions. These tests indicated the many engineering and economic advantages to be derived from the use of these versatile and durable metals. Copper-silicon alloys possess relatively high strength, having a minimum tensile strength in the soft or annealed condition of 50,000 lb. per square inch ranging up to 100,000 lb. per square inch in cold-worked forms. They are highly resistant to fatigue and have excellent fabricating and welding properties. The corrosion resistance of these alloys is equal, if not superior, to pure copper.

The sewage-treatment field has been expanding quite rapidly, especially in the last decade. Ever-increasing growth of cities and towns have posed new problems for the sanitary engineer. A new era of social responsibility is resulting in the elimination of insanitary methods of sewage disposal. This new concept

### High Strength Steel for Mine Ladders



Shipping about 750 ft. of safety ladders with landings, gratings and safety cages for ventilating shaft at Marianne Mine No. 58, Ellsworth, Pa. To save weight and give longer lift these ladders were made of Mayari R high strength, corrosion resisting steel, having a minimum tensile strength of 70,000 pounds per sq. in., a yield point of 50,000 pounds per sq. in. min., and a resistance to atmospheric corrosion about six times that of ordinary low carbon steel

of sewage treatment has made it necessary for the manufacturers of corrosion-resistant metals to work in close cooperation with engineers and operators of sewage-treatment plants.

### Old District Explored By New Jersey Zinc

Exploration of one of the earliest zinc producing districts in America—that south of Bethlehem, Pa., near the old Friedensville zinc mines—is being carried on by the New Jersey Zinc Company, with 15 drills in operation.

The Reynolds Metal Company had an option to purchase the old Friedensville zinc properties in Lehigh County, idle for the last half century, but allowed the option to lapse in 1938.

### Canisteo Mine and Plant Changes

An alteration and construction program is now under way at the Canisteo iron mine of the Cleveland-Cliffs Iron Company at Coleraine, Minn.—one of the largest open-pit operations on the western Mesabi range. The ore washing plant is being dismantled and will be reassembled at another

site near the north side of the Canisteo pit. During the winter a new belt conveyor system will be installed by Link Belt Company that will elevate the ore from a receiving bin in the pit to the top of the concentrator. Haulage operations in the pit will thus be completely motorized.

### Federal Extends Holdings

Federal Mining and Smelting Company has extended its holdings through purchase of the Fanny Grem mining claim and a fraction called the Twenty-Two Short, both adjoining the Morning and You-Like mines at Mullan, Idaho, for \$50,000 under a lease and bond agreement.

### Successful Air Hygiene Meeting

Tuned to the theme that "Healthy Workers Make for Healthy Business," the fourth fall meeting of Air Hygiene Foundation was held at its headquarters, Mellon Institute, Pittsburgh, on November 14-15. More than 250 persons attended, a new attendance high. They represented 101 companies in the basic industries from Massachusetts to Utah. Guests included representatives of the U. S. Public Health Service, U. S. Department of Labor, labor organizations



and institutions interested in employee health work.

Virtually all aspects of industrial health work were covered, ranging from the interests of top management to problems confronting the physician, engineer and safety director. The program included cost figures showing that industrial hygiene "is a very good way of making money," a symposium on sick absenteeism, progress reports on the Foundation's medical and engineering researches, a review of recent occupational disease legislation and a form on the impact of employee health on industrial and public relations.

Two rabbits with "windows" affixed to their ears were exhibited by Dr. Eliot R. Clark and Darrow Haagenzen of University of Pennsylvania to illustrate medical studies which the Foundation helps support at Penn. With the aid of a microscope delegates could look through the "window" and see the effects of toxic materials in living tissue.

Dr. L. U. Gardner of the Medical Committee, reporting on his work at Saranac Laboratory, announced that a department of petrography had been established with a Foundation grant and that this assisted him in studying effects of inhalation of different dusts. Some 150 samples of rock from 14 industries were classified during the year, providing valuable data for evaluating industrial dust hazards.

Prof. Philip Drinker, Chairman of the Preventive Engineering Committee, described the Foundation's two projects at Harvard: 1. Investigation of the characteristics of electroplating tanks, baths and vats using toxic solvents and liquids to provide a rational basis of design; 2. Determination of the most dangerous size-range of dust particles in order "to focus our efforts particularly against them," as in the design of respirators and other dust-capturing equipment.

Andrew Fletcher, vice president, St. Joseph Lead Company, cited cold cost figures to prove that "all employees gain through improved work-conditions, and all employers benefit through lower operating costs."

Theodore C. Waters, chairman of the Maryland Occupational Diseases Commission and member of the Foundation's Legal Committee, reported that "24 states and the District of Columbia now have occupational disease compensation statutes." Five other states have authorized commissions to consider such legislation. He analyzed proposed Federal legislation designed to give Federal aid to states granting compensation for occupational diseases.

Robert J. Watt, International Labor Representative, American Federation of Labor, lauded the "encouraging initiative which industry has shown in its support" of such an organized effort to improve employee health, and declared "here is one issue upon which employers and workers can agree." He asserted that the A. F. of L. wanted to avoid strife, but that its members would seek this method unless industry accepts its responsibility to provide healthful work places.

V. P. Ahearn, Executive Secretary, National Industrial Sand Association; C. C. Carr of the Aluminum Company of America; Dr. C. O. Sappington, industrial consultant, and others discussed employee health as a force in industrial and public relations. Employers were urged to tell the story of their humane contributions, as in matters of health improvement.

Dr. A. J. Lanza, chairman of the Foundation's Medical Committee, led a symposium on "Sick Absenteeism," in which half a dozen medical directors and industrial hygiene engineers participated. Companies were urged to make "detailed studies of departmental and occupational sickness records." It was shown that short-term disabilities lasting less than eight days are the greatest concern to industry. Respiratory disorders apparently account for almost half of the absences, which amount to anywhere from 5 to 10 days per year for the average male worker. The lost-time rate for women is even higher.

### October Manganese Ore Statistics

Domestic production of manganese ore containing 35 percent or more manganese (natural) during the month of October was 3,400 long tons, shipments were 3,200 tons, and producers' stocks at the end of the month were 1,600 tons, according to the Bureau of Mines, United States Department of the Interior. These figures are predicated on reports received from producers that accounted for 88 percent of the total in 1938. In September production and shipments were 3,000 and 2,500 tons, respectively, and producers' stocks at the end of the month were 1,300 tons. The rate of shipments during October was considerably more than the monthly average of 2,110 tons in 1938, when the total amounted to 25,321 tons.

Arkansas, Montana and Tennessee supplied about 86 percent of the total manganese ore shipped in October. Production was reported also from Alabama, Georgia, Utah and Virginia.

According to data supplied by the Bureau of Foreign and Domestic Commerce, October imports for consumption of manganese ore containing 35 percent or more manganese were 111,900 long tons containing 57,215 tons of manganese. Of the imports in October, the Gold Coast supplied 42 percent; British India, 19 percent; the U. S. S. R., 30 percent, and Cuba, 9 percent. For the first 10 months of 1939 imports for consumption were 470,859 long tons containing 236,622 tons of manganese, of which the Gold Coast supplied 41 percent; the U. S. S. R., 22 percent; Cuba, 16 percent; British India, 15 percent, and Brazil, 6 percent. In addition, 18,424 tons containing 5,343 tons of manganese (29 percent Mn) were entered from the Union of South Africa.

General imports, which represent the movement to this country, amounted to 45,260 long tons containing 22,059 tons of manganese in October, of which Brazil supplied 17 percent; the U. S. S. R., 12 percent;

British India, 18 percent; Gold Coast, 29 percent, and Cuba, 24 percent. All the above ore contained in excess of 35 percent manganese; there were no receipts of ore containing 10 to 35 percent manganese in October. For the first ten months of 1939, general imports of ore containing 35 percent or more manganese were 527,304 long tons containing 260,008 tons of manganese, of which 31 percent came from the U. S. S. R., 24 percent from Gold Coast, 17 percent from British India, 14 percent from Cuba, and 13 percent from Brazil. In addition, 18,424 tons containing 5,343 tons of manganese (29 percent Mn) moved to this country from the Union of South Africa.

Stocks of manganese ore in bonded warehouses as of October 31 amounted to 886,020 long tons containing 437,425 tons of manganese compared with 842,048 tons containing 418,721 tons of manganese at the beginning of 1939.

### Madeira Hits Russian Anthracite Imports

That the increase of 29 percent in New England receipts of Russian anthracite during the first 10 months of 1939 over 1938 is deplorable, was pointed out recently by Louis C. Madeira III, executive director of the Anthracite Institute, in commenting on the latest reports of the United States Bureau of Foreign and Domestic Commerce. In further discussing the competition of Soviet produced coal with Pennsylvania anthracite, Mr. Madeira said, "This competition displaced some 120,000 man days of work in the 10 months alone at our collieries, to say nothing of incidental transportation and other labor. And the worst of it is, New England consumers, for the most part, do not realize that they are buying Russian goods produced under the Communistic system to the detriment of American industry operating under contract with the United Mine Workers of America at the highest wage rate in the history of the coal industry. Imports from the Soviet for the 10 months of 1939 totaled 212,442 net tons.

### Southern Appalachian Association Meets

Meeting in Knoxville late in November, members of the southern Appalachian Coal Operators Association reelected all officers and directors, including L. C. Gunter, as president, secretary, and treasurer; B. E. Cheely as first vice president, and John W. Williams as second vice president.

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### Freeport Sulphur Molybdenum Prospect

A molybdenum prospect 50 miles southwest of Goldfield, Nev., is being surveyed by the Freeport Sulphur Company. It is stated that 10 men are at work on the property in Alum Gulch, surveying the area and testing it by diamond drilling.

### Rules 1939 Coal Mine Shutdown Not A "Strike"

Common Pleas Judge Joy Seth Hurd, of Cleveland, ruled on December 26 that the shutdown last spring in the Appalachian coal area was not a strike, and that miners therefore were entitled to unemployment insurance for the six weeks of unemployment. The ruling was handed down in the case of the United States Coal Company of Cleveland in a test appeal of a compensation claim allowed a miner from Bradley, Ohio.

If this decision were to hold and be applied generally throughout the area, it might be the basis for filing of \$15,000,000 in insurance claims by 340,000 miners in the Appalachian states.

### Wheels of Government

(Continued from page 51)

removal of Dr. John Wellington Finch as director of the United States Bureau of Mines. The public press has criticized Secretary Ickes severely for his unjustified treatment of an ethical, able, technically-qualified and thoroughly experienced mining engineer and geologist, and the Secretary's replies, as printed, are anything but convincing as a justification of his actions.

It is well known that Secretary Ickes desired the Federal Coal Mine Inspection Bill as an additional enforcement lever to assist in compelling bituminous coal producers to accept his administration of the Guffey Act. Present estimates are that the prices which the Bituminous Coal Division of the Interior Department intends to fix on bituminous coal cannot be promulgated and made effective before April 1, and perhaps not then. In the meantime, the industry in a major part of its tonnage is complaining bitterly of the harm which has been done by the Guffey Act in holding off the proper stabilization of large sales agencies, and of the Federal tax levied on them, together with the heavy expense to which they are being put under the Act's administration. The appropriation in the 1941 budget for the administration of the Guffey Act has been cut approximately \$1,000,000 below that for 1940, and it is common talk in Washington that the

Act is a headache to administration leaders, and that it may be permitted to die in 1941. With such an attitude the proper thing to do would be to repeal the Act immediately and refund the \$8,000,000 which the Government has taken in taxes from the producers who are badly in need of it.

### Stream Pollution

The bill by Senator Barkley of Kentucky and Representative Mansfield of Texas, which passed the Senate in the first session and had been granted a rule for House consideration near the close of the Congress, is ready for action at any time at the will of the Congressional leaders. It is a cooperative type of bill which is acceptable to industry, providing for planning and survey work by Federal agencies in cooperation with the agencies of the various states. It is now understood that Representative Mundt of South Dakota will soon introduce an amended form of his mandatory type of bill which the wild-life societies were pressing during the last session. Apparently it is Representative

Mundt's plan to endeavor to substitute his bill for the Barkley-Mansfield bill when the more reasonable measure comes up for floor consideration.

### Miners Turn Operators in Missouri Experiment

With their coal mines closed due to a wage strike, mine owners and miners at Kirksville, Mo., are trying an experiment to prove who is right about the wages to be paid. The miners ask a wage increase from \$3.50 to \$5 a day, and the owners assert the mines cannot pay a profit on the investments under such a higher wage scale. To prove it, they offered the union coal miners a chance to prove the contention that two mines could not be operated at a profit if their demands for higher pay and shorter hours were granted.

Emmett Corrigan and the Blacksmith brothers have offered their mines to 300 striking union employees, the former proposing to let the men run his mine for one month, and the latter for two months. In making their offer, the operators stipulated that the miners must assume any losses that were incurred during the trial period, and if there was any profit the miners could share them among themselves.



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## Truck Size Milling Plant

R. S. Handy, superintendent of the Bunker Hill and Sullivan mills at Kellogg, Idaho, has designed a small milling plant which can be mounted complete on an automobile truck, intended for the use of small mines and prospects.

The complete arrangement comprises a compact milling plant including crusher, flotation, cleaner, filter, and separate units for making lead, silver, zinc, or gold concentrates. It can be operated with a gas or diesel engine of 5 to 10 hp., and is designed to treat any small amount of ore up to 30 or 40 tons per day.

## BOOK REVIEWS

**CYANIDING FOR GOLD**, by Ion L. Idriess; 270 pages. Angus & Robertson, Sydney, Australia, 1939. Price 10 shillings, equivalent at current exchange to about \$1.90.

The author is the most prolific and popular writer in Australia, on all topics, in books and in magazine articles. His "Prospecting for Gold," written in simple terms, is now in its seventh edition. "Cyaniding for Gold" has been written for prospectors and for operators of small mines or old tailings dumps, but an index and considerable condensation including the elimination of repetition would make the book more understandable. However, the simple explanations and talk (chapter 21, "Talking Over the Subject," for instance) is entertaining and practical, and should be understood by the readers for whom the book has been prepared. It does presuppose that these men have had some instruction in laboratory work, as is given by some mining schools in Australia and in North America.

Few books of this type say much about sampling, but chapter 1 tells how to sample tailings dumps and how to calculate their gold content. Then follow chapters on the leaching of sand and the agitation of slime with the equipment required and the problems involved; how to make up and test the strength of cyanide solutions; precipitation on zinc and the clean-up; smelting the precipitate; and assaying the bullion. E. W. O'Brien contributes two chapters on building a sand plant and its operation, with a note on cyaniding concentrates and silver-bearing tailings, and on charcoal precipitation. Three chapters on how to test solutions are rather lengthy, and the new and important use of air-slaked lime for tailings containing antimony and gold could be shortened. Other chapters discuss cyanicides, as copper and iron sulphides including pyrrhotite, concentrate treatment, amalgamation, flotation, the art of assaying, testing for minerals, and several pages of general useful information.

"Cyaniding for Gold" and its companion, "Prospecting for Gold," should be in prospectors' kits for a practical reference.—M. W. von Bernewitz.

**MEDICOLEGAL PHASES OF OCCUPATIONAL DISEASES.** By C. O. Sappington. Published by Industrial Health Book Co., 540 North Michigan Ave., Chicago, Ill., 1939. Pp. 400. Price \$2.75.

Industrial health, industrial hygiene, industrial medicine and occupational diseases are being stressed at the present time and involve numerous difficult problems, and for this reason appearance of an authoritative treatise concerned with these subjects is especially opportune.

The book is divided into four parts: (1) Industrial, (2) Insurance, (3) Medical and (4) Legal, and the relationships of the personnel of each of these divisions are shown throughout the text, indicating the necessity of full cooperation of the business executive, the insurance carrier, the industrial physician and the lawyer in solving common problems. Each part consists of an introduction, and chapter texts, followed by a summary and list of references to that particular field. There is an excellent appendix, and the volume is especially well indexed.

The author, a consultant in occupational disease and industrial hygiene, is a well known authority in this field, and for his work in writing this book was given in June of this year at the Annual Meeting of Industrial Hygiene and Surgeons, the William S. Knudsen Award for the most outstanding contribution to industrial medicine in 1938 and 1939.

**MILLING METHODS—1939.** Transactions American Institute of Mining and Metallurgical Engineers. Vol. 134 (Sponsored by the Rocky Mountain Fund). Published by the Institute, 29 West 39th St., New York, N. Y. Pp. 459. Price \$5.00.

This, the first regular AIMME transactions volume concerned entirely with milling methods since publication of the 1934 volume, brings together under one cover a collection of 31 technical papers on various phases of concentration that have been presented at annual New York meetings in 1935-1939, inclusive, and at the 1938 Tucson meeting.

The collection presents a representative cross-section view of new developments in concentration methods, surveyed by authorities in that phase of metallurgical work, including operating men at the mills, government and college research men, and experts from the staffs of manufacturers of concentrating equipment. The preponderance of papers are concerned with flotation (11) and with various phases of grinding (8), in keeping with the importance of these two concentration steps in present-day operations. There are also several excellent papers outlining milling practices at modern plants, including three in the Philippines. The very complete paper on milling methods at New Cornelia concludes a volume containing a wealth of valuable data that, although published separately some time ago, is now arranged for convenient reference of mill men within a single volume.

## PUBLICATIONS of INTEREST

### U. S. BUREAU OF MINES

- R. I. 3444. MEASUREMENT OF PRESSURES ON ROCK PILLARS IN UNDERGROUND MINES, PART 1, by Leonard Obert. 15 pp. 6 figs.
- R. I. 3453. RELATIVE AIR DUSTINESS DURING CYCLE OF OPERATIONS AT MOUNT WEATHER TESTING ADIT, by John A. Johnson and Wing G. Agnew. 7 pp. 2 figs.
- R. I. 3463. IGNITION OF FIREDAMP BY EXPLOSIVES, by Bernard Lewis and Guenther von Elbe. 11 pp. 3 figs.
- R. I. 3464. RECENT RESEARCH BY THE BUREAU OF MINES ON THE IGNITION OF FIREDAMP BY EXPLOSIVES, by S. L. Gerhard, J. C. Holtz and Wilbert J. Huff. 12 pp. 9 figs.
- R. I. 3465. METHODS OF ROCK-DUSTING AMERICAN COAL MINES, by J. J. Forbes. 22 pp.
- R. I. 3466. OXIDATION OF CARBON MONOXIDE AND HYDROGEN BY BACTERIA, by G. W. Jones and G. S. Scott. 10 pp. 8 figs.
- R. I. 3468. CHEMICAL CONSIDERATIONS RELATING TO FIRES IN ANTHRACITE REFUSE, by G. W. Jones and G. S. Scott. 13 pp. 3 figs.
- R. I. 3472. REDUCTION OF FLY-ASH EMISSION FROM CHIMNEYS, by J. F. Barkley. 10 pp. 38 figs.
- R. I. 3478. DUST PRODUCED BY DRILLING WHEN WATER IS SPRAYED ON THE OUTSIDE OF THE DRILL STEEL, by John A. Johnson and Wing G. Agnew. 6 pp.
- I. C. 7084. MINING AND MILLING METHODS AND COSTS AT THE BLACK HILLS TIN CO., TINTON, S. DAK., by Jos. R. Guiteras. 16 pp. 2 figs.
- I. C. 7085. SAVING GOLD BY MEANS OF CORDUROY, by M. W. von Bernewitz. 17 pp. 4 figs.
- I. C. 7086. TESTING AND DESIGN OF RESPIRATORY PROTECTIVE DEVICES, by H. H. Schrenk. 10 pp. 5 figs.
- I. C. 7087. INVESTIGATION OF ELECTRICAL EQUIPMENT, SAFETY LAMPS, AND GAS DETECTORS FOR SAFETY, by L. C. Hilsley. 13 pp. 3 figs.
- I. C. 7089. FORMATION, COLLECTION, AND TREATMENT OF COAL DUST IN MINES, by D. Harrington. 11 pp.
- I. C. 7090. SOME FUNDAMENTALS OF SMOKE ABATEMENT, by J. F. Barkley. 59 pp.

### U. S. GEOLOGICAL SURVEY

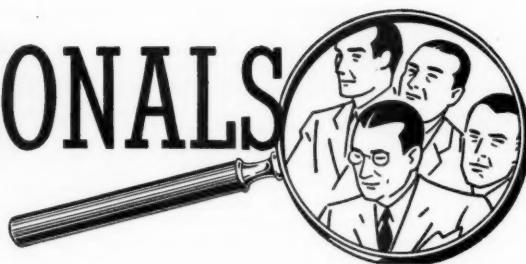
- P. P. 192. AREAL GEOLOGY OF ALASKA, by Philip S. Smith. 100 pp. 18 plates. \$1.25.
- Bull. 905. THE COAL RESOURCES OF McCONE COUNTY, MONTANA, by A. J. Collier and M. M. Knechtel. 80 pp. 16 plates. 49 figs. 75 cents.
- Water-Supply Paper 836-D. GROUND WATER IN THE UNITED STATES, A SUMMARY, by Oscar Edward Meinzer. 232 pp. 1 plate. 31 figs. 15 cents.

### MISCELLANEOUS

- THE MINING LAWS OF CANADA—A Digest of Dominion and Provincial Laws Affecting Mining, by Arthur Buisson. Mines and Geology Branch, Bureau of Mines. 110 pp. 25 cents.
- COAL REPORT—ILLINOIS, 1938. Department of Mines and Minerals. 280 pp.
- NE-SAW-JE-WON—A Tale of the Waters That Run Down from Lake Superior to the Sea, by Helen M. Martin. 16 figs. 15 plates. De Luxe: Case-bound, blue cover—stamped in silver; \$1.00 per copy. Paper-bound: blue cover—printed in silver; 60 cents per copy.



# PERSONALS



**Grant Stauffer**, president of the Hume-Sinclair Coal Mining Company and a number of other coal companies in the Southwest, Kentucky and Illinois, was recently unanimously elected president of the Chamber of Commerce of Kansas City, Mo.

**Dr. L. E. Young**, of Pittsburgh, Pa., addressed the student body of Montana School of Mines, December 6, on "Our Jobs as Engineers."

**F. E. Wormser**, secretary-treasurer of the Lead Industries Association, pointed out the importance to agricultural engineers of a knowledge of paint in a speech given at the fall meeting of the American Society of Agricultural Engineers in Chicago, December 6.

**J. R. Linney** has been named district manager of the Adirondacks district of Republic Steel Corporation, a newly consolidated division embracing all of the northern New York mining operations of that company.

**Wm. B. Daly** has resigned as manager of mines for the Anaconda Copper Mining Company. He is succeeded in that position by **J. J. Carrigan**, since 1930 general superintendent of mines.

**Mr. Daly**, whose resignation due to ill health was regretfully announced by Vice President **D. M. Kelly**, will continue with the company as consulting engineer. He has performed active service for the Anaconda company for 40 years, the last 15 as manager of mines.



**J. J. Carrigan**

**Mr. Carrigan** has risen through the ranks of the company, having started his career as a miner in Butte over 30 years ago.

**E. S. McGlone** succeeds **Mr. Carrigan** as general superintendent of mines, and **F. A. Linforth**

continues as assistant to the manager of mines.

**Ralph M. Hartman**, secretary of the West Virginia Compensation Commission, recently resigned that post to accept a position in the compensation department of the Bethlehem Mines Corporation, a subsidiary of the Bethlehem Steel Corporation. In his new capacity he will oversee the compensation work of the company's mining operations in five states.

**Ralph M. Hoffman**, vice president and sales manager of Link-Belt Co., Pacific Division, San Francisco, for the last eight years, has been appointed assistant to the president of the parent organization, Link-Belt Co., with headquarters at the company's general office at Chicago.



**M. L. Workman**, formerly superintendent at the Beards Fork Mine, Beards Fork, W. Va., of the Koppers Coal Company, has been made assistant division superintendent for the same company, with headquarters at Powellton, W. Va. **E. E. Stephenson**, formerly superintendent at Kimberly, has taken the place vacated by **Mr. Workman** at Beards Fork.

**W. W. Watson**, secretary of the Oliver Iron Mining Company, Duluth, Minn., has been elected treasurer of the company to fill the vacancy occasioned by the retirement of **J. T. Melvin**. In the future he will continue as secretary, filling both positions.

**James W. Wade**, vice president and general manager of the Tintic Standard Mining Company since 1918, has been elected president of that company and its subsidiaries including the



Eureka Standard Consolidated Mining Company. He succeeds the late **Ira D. Travis** who had been president since 1933.

**Harold E. Raddatz**, formerly a director, will replace **Wade** as vice president.

## — OBITUARIES —

**Spencer Penrose**, widely known mine operator and financier who amassed a fortune in early Cripple Creek days, died at his home in Colorado Springs, December 7, of a throat ailment at the age of 74.

Following his brilliant financial successes from mining promotions in the Cripple Creek gold rush back in the 80's, and later interest in developing the Utah Copper Company, **Mr. Penrose** built the Broadmoor Hotel in Colorado Springs, adding a golf course, rodeo and polo grounds, zoo and ice skating rink, to make it one of the best known resorts in the country.

In addition to his mining and Broadmoor activities, **Mr. Penrose** was widely known through his place in Republican party inner circles and his anti-prohibition efforts.

**Nat B. Stevens**, president of the Stevens Coal Co., died suddenly December 14 at his home in Tunkhannock, Pa. Although he had not been in the best of health for the past three years, his death came very unexpectedly. His age was 48.

He was the founder of the Stevens Coal Company, and about three years ago built the Cameron Breaker, one of the finest in the Wilkes-Barre region.

**Joseph H. Kirkwood**, for many years identified with the DeBardleben Coal Corporation and other producers in the Birmingham district in a mining executive capacity, died in Parrish, Ala., November 27, at the age of 56.

**A. C. Hansen**, for many years a well-known iron ore mining executive of Negaunee, Mich., died suddenly November 12 while traveling from Mineville, N. Y., to Pittsburgh, Pa. His age was 49.

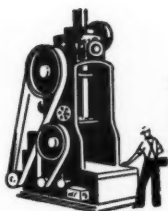
**John A. Traylor**, founder of the Traylor Engineering Co. and president of the Royal Tiger Mines Co. of Colorado, died recently.

**Oscar Hershey**, well-known mining geologist of California, died unexpectedly of a heart attack, December 11, while in Wilmington, Del. His age was 65. For many years **Mr. Hershey** was chief geologist of the Bunker Hill and Sullivan Mining & Concentrating Co., and did geologic work for other important mining firms.

**Abner A. Liggett**, vice president and treasurer of the Raleigh Coal & Coke Company, died December 21 in Cincinnati after a short illness. He was 56 years of age.

**J. O. A. Carper**, veteran Colorado mining man for almost 50 years, died December 14 in Denver, Colo., at the age of 74. He had been ill more than a year.

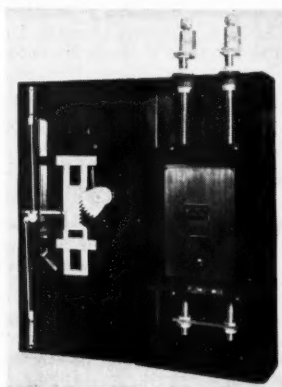
More than 20 years ago **Mr. Carper** originated for the Colorado Mining Association the "sowbelly" dinner, which has become one of the biggest festive affairs of the Colorado mining industry.



# MANUFACTURERS' Forum

## Circuit Breaker to Reduce Fire Hazards

The I-T-E Circuit Breaker Co., 19th and Hamilton Streets, Philadelphia, Pa., announce that the Type ETB 4/0 trolley wire protector—a 500 ampere, 275 volt, two pole, manually operated circuit breaker which has had a wide general industrial use for many years in protecting direct current lighting and power circuits—now becomes available with special features for mining industry applications in reducing mine fire hazards resulting from overheated 4/0 trolley wires. It is offered to provide positive protec-



tion for isolated branch circuits, usually consisting of 4/0 trolley wire feeders, by interrupting these circuits before an annealing temperature is reached by the copper, causing the wires to sag and endangering material beneath.

The unit is supplied in a black finished sheet steel enclosure arranged for wooden post or cross-arm mounting. The enclosure is formed from heavy gauge bonderized steel, and is fitted with a dust and moisture resistant, hinged and felt gasketed door suitable for severe underground operating conditions. Ample provision has been made to facilitate underground installations.

Additional details are included in company's bulletin 3909, a copy of which will be gladly furnished upon request.

## Link-Belt and Fairmont Licensed Under Peale-Davis and American Dry Cleaning Patents

Fairmont Machinery Co. and Link-Belt Company announce that they have been licensed by Peale-Davis Co., St. Benedict, Pa., under the Peale-

Davis process patents covering the air-cleaning of coal.

They further announce that the American Coal Cleaning Corporation, Kingsport, Tenn., has granted Fairmont Machinery Co. and Link-Belt Company an exclusive license to manufacture, sell and install the American table under its patents. The American Coal Cleaning Corporation, however, retains the right to continue to sell its tables to the coal industry direct.

They also announce that completely modernized dry-cleaning equipment has been developed and is now being offered.

The American Coal Cleaning Corporation is the originator of the pneumatic treatment of coal, the first commercial plant having been placed in operation in 1920. The combined installed capacity of its plants is in excess of 36,000,000 tons per year.

## Scraper Mucking Manual

"Modern Methods of Scraper Mucking and Loading" is the title of a new 183-page handbook written by the engineering staff of Ingersoll-Rand Company, 11 Broadway, New York. It is in reality a complete textbook on scraper mucking and loading and should prove of interest and value to all mine managers and superintendents.

The volume is of attractive appearance and is profusely illustrated with line drawings showing various methods of scraper mining and with instructive photographs. Voluminous data are included in the descriptions of typical installations that are pictured. The numerous applications of scrapers in the mining of metals, non-metallic materials and coal are explored and covered. The design of scrapers, hoists, ropes, sheaves, ramps and slides is extensively discussed.

This new book is a distinct contribution by a manufacturer of equipment to an industry that it serves. Executives of mining, quarrying and contracting companies may obtain copies without charge from any Ingersoll-Rand branch sales office. A student edition sells for \$1 a copy and may be obtained from Compressed Air Magazine Company, Phillipsburg, N. J.

## New Company to Handle Wheat Cap Lamps

Koehler Manufacturing Company of Marlboro, Mass., manufacturers of Wheat Electric Cap Lamps and Koehler Flame Safety Lamps, announce the formation of Wheat Lamp

Sales, Inc., to handle the distribution and serving of Wheat and Koehler Lamps in the Eastern bituminous and other coal fields.

General sales supervision will be in charge of Mr. A. C. Dick, who has supervised Wheat Lamp sales and service in the anthracite and Eastern bituminous fields and has recently been engaged in building a Wheat sales-service organization in these fields, in which he is widely known.

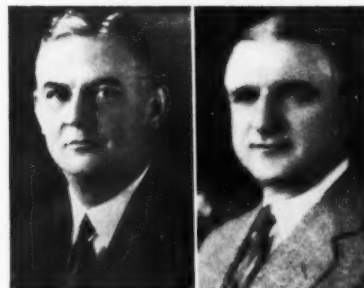
The headquarters of Wheat Lamp Sales, Inc., are at 1009 Bessemer Building, Pittsburgh, Pa., where new offices have just been opened.

The new company announces that Morley S. Sloman has recently joined its staff as district manager in charge of the western Pennsylvania, northern West Virginia and Ohio territories. Mr. Sloman is well known in these territories through his former association with the sales organization of the Sullivan Machinery Company. He was recently in charge of that company's district sales office at Huntington, W. Va.

## Exide Executive Changes

At a recent meeting of the board of directors of the Electric Storage Battery Company, Frank T. Kalas, general sales manager, was elected third vice president. He succeeds H. B. Gay, who retired from active service December 1, 1939, after 38 years in the employ of the company.

Starting with the company at the



FRANK T. KALAS

H. B. GAY

bottom of the ladder, Mr. Kalas soon earned promotion and served as a salesman, Washington branch manager, district manager, assistant general sales manager and general sales manager.

Mr. Kalas has had a long and varied experience in all fields of storage battery application and will direct the sales activities of the company as vice president and general sales manager.

Mr. Gay began his career in the

sales department and in a few months was assigned to Baltimore as manager of that branch. Two years later, in 1903, he was advanced to the managership of the Cleveland branch, which position he occupied for 17 years. He was transferred to Philadelphia in 1920 and became general sales manager. In 1926 he was elected fourth vice president, and in 1928 third vice president and a member of the board of directors.

### Improved Insulators and New Bracket

Having developed a special conducting glaze for the purpose, the Ohio Brass Company, Mansfield, Ohio, is now producing a complete line of radio-proof pintype insulators in which this glaze is applied under the regular glaze at critical areas. Known as conduction-Glazed Silentytes, these insulators supplement the company's line of metallized Silentytes. The underglaze is applied to the conductor groove, the tie wire groove, the pin hole and the joints (of multiparts). After the conducting glaze is applied the insulator is coated with the regular outer glaze and then fired. The conducting element in the underglaze comes through the outer glaze during firing, making a good bond with the



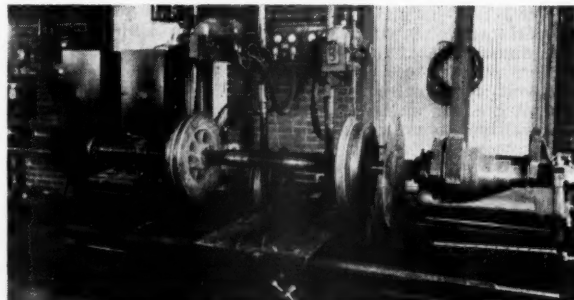
tie wire and conductor. The electrostatic flux is redistributed in such a way by the conducting surface that most of the lines of flux pass directly into the porcelain. Thus they cannot produce radio interference by overstressing the air adjacent to the conductor and tie wire. By proper resistance grading the potential at the edge of the treated area on the head is reduced sufficiently to eliminate the need for any special flux control feature. Aside from offering good radio characteristics, the manufacturer claims that the new conduction glaze results in a high degree of uniformity, provides a treatment which is permanent electrically and mechanically, prevents conductor abrasion by providing a smooth finish and permits use of the time-tested standard pintype designs. The conduction-glazed Silentyte line includes all sizes of high-voltage pintypes, both multiparts and uniparts, as well as the low-voltage pintypes.

Also announced by Ohio Brass is a new type of bracket, known as the

### Mine Locomotive Tires Rebuilt By C. E. Welding

Mine 43 of the Peabody Coal Co. in Illinois has welded up 1,376 worn mine locomotive tires with a breakage of only 11 units. Since the development of improved welding practices there has been no breakage whatever. This coal company, with mines situated throughout much of southern Illinois, has had many years of experience in repairing the tires. This experience has led to a method which apparently eliminates the uncertainty of results.

Several elements figure in the successful process. First, the worn-out tire is preheated. Then, during the welding procedure, a continuous motor-operated peening hammer is directed on the new bead while the wheel is slowing cooling in a heat-insulated case. Among the equipment used are General Electric arc-welding sets together with automatic heads, cables, reels, torch, peening unit and geared-down welding lathe.



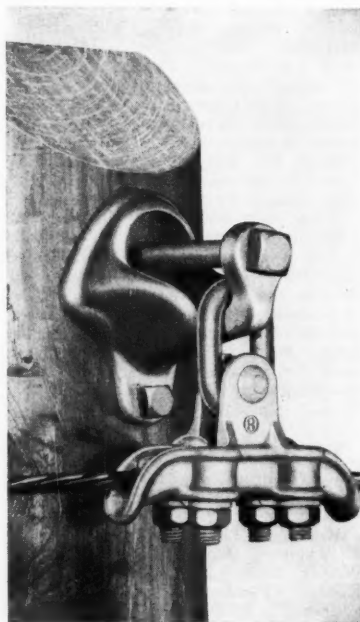
Since in most cases the deposited material is softer than the original tire, the repaired unit actually has more traction than it had when new. This, however, is dependent upon the type of electrode used. A hard surface may be put on if that seems preferable.

Officials of the Peabody Coal Co. have expressed satisfaction with the method. Since many varying factors are involved in determining the cost of such a repair job under different

conditions, it is difficult to determine the exact expense per wheel. The figure of \$11 per tire, however, has been given as the over-all cost for such a job.

Swing-Link, designed to provide a flexible support with high slip strength for ground wires. The main body casting of this bracket has a groove on the outer side which holds a link at a distance of 3 inches from the pole. The link, in turn, supports a regular suspension clamp for holding the ground wire. Since the link is free to swing on the bracket proper and

there is a flexible connection between the link and suspension clamp, the device allows a ground wire to swing through a wide arc laterally, thus preventing damage to a wire when it is swayed by wind. This flexible arrangement also permits the bracket to be used for angle positions. By employing a regular suspension clamp to hold the ground wire, high slip strengths can be developed. The bracket is attached to the pole by a through bolt and is kept from turning by a lag screw. All parts are thoroughly and smoothly hot-dip galvanized. The Swing-Link can be furnished three ways—without a suspension clamp, with a 0.46-inch clamp or with a 0.60-inch clamp.



### 9 New Types of Elastic Stop Nuts

Elastic Stop Nut Corporation, 1015 Newark Avenue, Elizabeth, N. J., announces an expansion of its line through the introduction of nine new types of nuts, all of which embody the basic Elastic Stop self-locking element, a resilient non-metallic collar which is built into the head of the nut.

This collar, in resisting the entrance of the bolt or screw, forces the thread faces into a pressure-contact which is maintained after the nut is tightened. With thread play thus eliminated, the nut cannot work loose under vibration, operating stresses or wear of surrounding parts.

The new types of nuts are designated as thin hexagonal, spline, internal wrenching, countersunk and counterbored one-lug anchor, countersunk



and counterbored two-lug anchor, countersunk corner anchor, bracket anchor, floating right-angle anchor and floating basket anchor. With variations in sizes, thread systems and materials, 160 new standard items are offered.

An extensively illustrated catalog, containing complete listings and a graphic explanation of the Elastic Stop principle, will be sent upon request to the manufacturer.

#### Hercules Branch Managers

F. George Trescher has been named manager of the San Francisco office of Hercules Powder Company. The appointment becomes effective January 1, 1940.

Mr. Trescher has been actively identified with the explosives industry for many years and has been a member of the Hercules West Coast organization since 1925. As an explosives engineer he has had a prominent part in some of the large construction projects in the West during the last 15 years. Mr. Trescher was named assistant manager of San Francisco office on March 1, 1939, and acting manager in August.

R. W. McKee is now manager of the Birmingham, Ala., office of the company, the appointment having been effective January 1, 1940.

Mr. McKee is well known to explosives consumers of the South and has been identified with the Hercules organization since 1922 as salesman and technical representative. He was named assistant manager of the Birmingham office on December 1, 1938, and acting manager on August 1, 1939.

#### Vulcalock Cements Now For Sale On Restricted Basis

Previously sold only under license agreements, its line of Vulcalock cements, described by the manufacturer as one of the most remarkable adhesives ever developed, has now been released for sale on a restricted basis, it is announced by the B. F. Goodrich Company, Akron, Ohio.

Vulcalock cements, the announcement says, have enabled users to accomplish assemblies previously considered impossible, particularly in making strong, waterproof, chemically resistant joints between rubber and metals. They also have unique properties in joining a wide variety of other materials, including many synthetic resins, woods and ceramics.

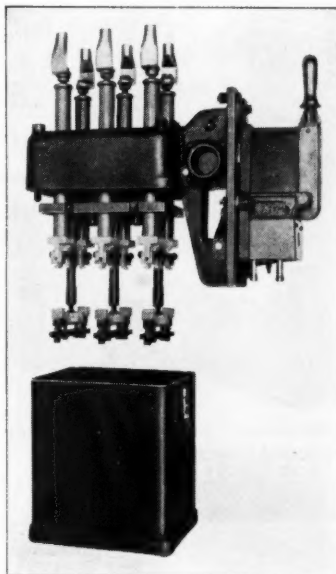
Not rubber, but solutions of Thermoprene, a patented thermoplastic made by chemical alteration of rubber, the cements when dried form tough, horny films. They are translucent, amber liquids of light engine oil consistency.

According to the manufacturer, the strength of bond ranges from 10 to 500 pounds per square inch, depending upon the method of application and the materials joined. The cements resist cracking by bending, shock or variations in temperature, have chemical resistance better than rubber itself, do not absorb moisture nor swell in water.

#### Switchboard Oil Circuit Breaker

A new switchboard type oil circuit breaker, capable of wide application to central station and industrial service is announced by the Boston Works of Allis-Chalmers Mfg. Co.

Designated as type KD-20, this 50,000 Kva interrupting rating breaker is of particular interest because the three poles are arranged one behind the other as viewed from the front or operating end of the breaker. The arrangement of the bushings so obtained eliminates the necessity of crossing the leads in certain applica-



tions of open and enclosed type switchboards. For the same reason, it is adaptable for replacing obsolete breakers of the same arrangement, as existing bus and feeder connections may be retained.

The type KD-20 is equipped with large butt type arcing contacts. The main current carrying contacts, silver-plated, are of the wedge and finger type for 600 amperes and wedge and laminated brush type for 1200 and 2000 amperes. Other features include: Bakelain bushings, enclosed low inertia high speed mechanisms, and vents to permit escape of gases incident to interruption.

Furnished for 600 amperes at 15 KV, 1200 amperes at 7.5 KV and 2000 amperes at 5 KV, it is arranged for flat surface mounting or for mounting in cells, switchhouses, cubicles, metal clad switching equipment and safety enclosed switchboards.

#### Heat-Treated Gears for Industrial Use

A complete line of heat-treated gears for heavy-duty industrial application has been announced by the Westinghouse Electric & Manufacturing Company. These gears, heat treated by the Barnes process (BP),

are especially designed for long life and dependability under adverse operating conditions, such as in cranes, mine hoists, locomotives, and in rubber, flour, cement, quarrying, and metal-mining machinery.

Heat treatment by the BP method gives the gears a hard wearing surface, tapering off on the inside to an extremely tough core. This characteristic of the process produces not only long wearing gear teeth, but also high shock resistance because of the tough core.

Gears in this new line ordinarily have approximately four times the life of an untreated gear or pinion under the same service and operating conditions. The rate of wear is nearly constant throughout useful life. Additional information may be secured from Department 7-N-20, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

#### Big Bend Contract to Roberts & Schaefer

Roberts & Schaefer Company, Chicago, Ill., is constructing a complete Stump Air-Flow Coal Cleaning Plant for Big Bend Coal Mining Co., Twin Rocks, Pa. The plant will have a capacity of 65 tons per hour of  $\frac{1}{2}$  x 0-inch coal and will be completed February 1, 1940.

## CATALOGS AND BULLETINS

• **ALLOY STEEL.** *American Manganese Steel Division*, Chicago Heights, Ill. Profusely illustrated catalog shows use of Manganese Steel Castings in a great variety of industries utilizing equipment whose parts are exposed to heavy impact and abrasion. 54 pages.

• **BEARING EQUIPMENT.** *Stephens-Adamson Mfg. Co.*, Aurora, Ill. Catalog 739 on company's Sealmaist Ball Bearing Pillow Blocks, Flange Units and Take-Up Units. 8 pages.

• **DRILLS.** *Bucyrus-Erie Co.*, South Milwaukee, Wis. Bulletin 29-T-2 stresses easy control, mobility and advantageous construction details of company's 29-T Blast Hole Drill. 28 pages.

*Ingersoll-Rand Co.*, Phillipsburg, N. J. Catalog 4301 presents in profusely illustrated form a brief and interesting history of rock drill development, together with the company's complete line of rock drills and associated equipment. Installation and shop views as well as tables of operating and physical characteristics for each class of machine are presented. 88 pages.

• **GRINDING MILLS.** *Traylor Engineering & Manufacturing Co.*, Allentown, Pa. Bulletin 2103 presents various designs of company's line of Grinding Mills. 32 pages.

• **MINE CARS.** *C. S. Card Iron Works Co.*, Denver, Colo. Booklet "Ain't She A Beauty!" on company's time-tested and mine-tested cars. 20 pages.

• **SHEAVES.** *Sullivan Machinery Co.*, Michigan City, Indiana. Bulletin 76-D describes company's Tail Rope Sheaves for use in slushing and scraper loading jobs.

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fire hazard; lower maintenance  
charges; decrease  
total energy consumption  
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advantages with Automatic  
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installations in mines.**

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breaker controls a section,  
confining disturbances to  
the area in which they arise.*

*Representatives in Principal Mining Areas*

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*Hundreds of Coal Operators Have Found  
UNIVERSAL VIBRATORS  
The Most Ideal Screen  
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Most slogans for business organizations are coined phrases designed to help sell either merchandise or service. Our slogan, "*In Business for Your Safety*," voices this company's policy; this organization's spirit.

More than thirty years ago Weed Tire Chains were put on the market to make motoring safer. Thus the American Chain and Cable Company was conceived in Safety and has al-

ways been dedicated to that ideal. Today ACCO products are to be found serving faithfully and safely in nearly every field.

Fifteen years ago we introduced preformed wire rope—American Cable TRU-LAY. We did so not only because preforming made TRU-LAY a rope of longer service but—a safer rope. TRU-LAY Preformed is safer to handle; safer to use. The heritage of safety is a tradition with American Chain and Cable men. The entire organization stands as a single unit behind the true meaning of "*In Business for Your Safety*."

**BUY ACCO QUALITY** whether it is American Cable Wire Rope and Slings—American Chains (Weed Tire Chains, Welded and Weldless Chains)—Campbell Abrasive Cutting Machines—Ford Chain Blocks—Page Wire Fence—Page Welding Wire—Page Traffic Tape—Reading-Pratt & Cady Valves—or any other of the 137 ACCO Quality Products.

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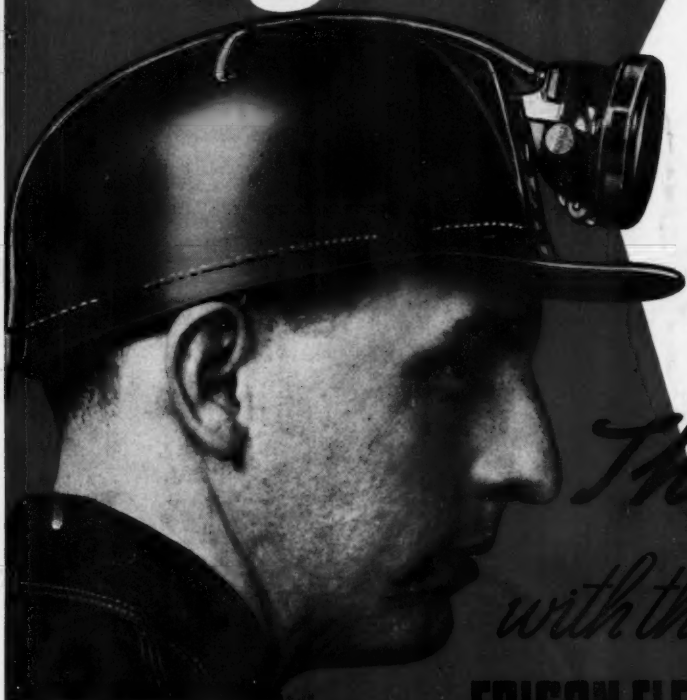
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# MORE LIGHT for YOUR Underground operations

**BETTER  
SAFETY RECORD**

**GREATER  
EFFICIENCY**



## *The* **M·S·A SKULLGARDS** *with the model "P"* **EDISON ELECTRIC CAP LAMPS**



The Model "P" Edison Electric Cap Lamp supplies the light—M. S. A. Skullgards the head protection—that combine to give you a *safer, better* operating basis below ground!

No other form of individual lighting for the miner provides the tremendous flood of effective illumination developed by the Model "P"—lighter in weight, stronger, more highly refined than any previous model. And no other form of miners' head protection can show the overwhelming popular acceptance Skullgards enjoy the world around.

Put these two in harness in your own operations, and you'll see how every feature proves out in performance. Let us arrange a demonstration for you, at your convenience—and meanwhile, write for our latest bulletins!



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